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# Table of Contents

**From the Founders:**

# Redefining, Reconfiguring, and Reaffirming Gifted Education: The Promise of Interdisciplinary Collaboration

**Ken W. McCluskey; Taisir Subhi Yamin**

It is neither our place nor purpose to respond in depth to Don Ambrose's provocative target paper; we'll leave it to the eminent scholars who have contributed to this special issue to take up that challenge. However, since his article captures much of what we hope the International Centre for Innovation in Education (ICIE), *Lost Prizes* International, and this journal (IJTDC) are all about – fostering interdisciplinary networking and collaboration, debunking intellectual prejudice, and supporting equity and talent development for all, including populations that have been systematically marginalized – we will take this opportunity to react selectively to some specific points in the piece that bear directly upon our overall mission.

From our perspective, this article is timely, especially since gifted education appears to be at a singularly pivotal period in its history. The times they are indeed a-changin,' for now educational specialty areas such as differentiated instruction, higher-order thinking, global citizenship (whatever that may be), and rapidly evolving technologies – once accepted as the prerogative of enrichment programming – are now readily available for the majority of students, and actually very much a part of their educational world taken for granted. In other words, many elements we once saw as proprietary features of the gifted domain have now been absorbed and become part of regular curriculum.

Rather than moving back to basics, in the new order teachers and learners are in the process of moving forward to new basics. For gifted education to remain static in the face of this emerging reality would be a prescription for self-destruction (McCluskey, Treffinger, Baker, & Lamoureux, 2013).

What is required is real change, "not simply rearranging or repackaging the same things that have always been done; the shifting paradigm in education requires new answers to new questions" (McCluskey, Treffinger, & Baker, 1995, p. 1). If it hopes to remain relevant, our discipline must adapt and become part of the evolution. Nonetheless, "the gifted world," for the most part, continues to remain rather dogmatic, inflexible, and resistant to change (Ambrose & Sternberg, 2012; Ambrose, Sternberg, & Sriraman, 2012). In his target paper, Ambrose offers some thoughts about the current problems and possibilities, along with a prescription of sorts for beginning to make gifted education less insular, less parochial than it has been to date. Our hope is that this special issue will serve to generate discussion, spark critical debate, and connect scholars who are willing to take risks to change the existing landscape.

For our part, we found Ambrose's article intriguing and extremely thought

provoking. The following focus areas, in particular, resonated with us:

## The value of partnering with other disciplines

The point Ambrose makes from the outset is that "gifted education might enhance its productivity by crossing its borders more frequently and navigating into the conceptual terrain of various disciplines." Said simply, our response to this comment is a resounding Yes! The raison d'etre of the annual ICIE International Conferences and *Lost Prizes*/ICIE Seminars is to bring together educators from different backgrounds to lay the groundwork for meaningful collaboration. As Ambrose notes, researchers and practitioners in gifted and talented education can learn valuable lessons from scholars in other domains. Narrow interdisciplinary (ID) work with colleagues from closely allied disciplines (such as creativity studies, English, and psychology) can often take place quite seamlessly. It is usually more difficult for GT people to engage in Broad ID partnerships with those from less compatible disciplines (say physics, chemistry, or math), but when undertaken and managed carefully such collaboration can be extraordinarily fruitful.

In our *Lost Prizes* work to reclaim disadvantaged populations, we have essentially taken a hybrid approach that weds theory and practice from both the enrichment and at-risk realms (McCluskey, Baker, & McCluskey, 2005; McCluskey, Baker, O'Hagan, & Treffinger, 1995, 1998; McCluskey, Treffinger, Baker, & Wiebe, 2016; Yamin, McCluskey, Lubart, & Ambrose, in press). We believe the blended connections – involving mentoring, problem solving, and strength-based interventions – are precisely why *Lost Prizes* has received substantial and enduring attention in the field and in the literature. It has proven truly effective to combine Creative Problem Solving strategies (Isaksen, Dorval, & Treffinger, 2011; Treffinger, Isaksen, & Stead-Dorval, 2006), usually associated with gifted education, together with programs developed specifically for at-risk students who traditionally have been viewed as troubled rather than talented. To illustrate, in their classic text, *Reclaiming Youth At Risk: Our Hope for the Future*, Brendtro, Brokenleg, and Van Bockern (2002) introduced their medicine-wheel Circle of Courage model, which highlights the importance of four universal needs in child development: belonging, mastery, independence, and generosity. Although their approach is based on Aboriginal traditions, the authors show how this worldview meshes with social psychological literature on the four "A's:" attachment (belonging), achievement (mastery), autonomy (independence), and altruism (generosity). In any case, although educators from the gifted and at-risk worlds don't often develop programs together, their disciplines are nevertheless closely allied, in that the concern of both is to reach out to unique populations of young people. And certainly, our projects connecting theory, research, practice, and practitioners from at-risk and gifted education, creativity and talent development, Aboriginal studies, and contemporary psychology have come together nicely to meet the needs of "lost prizes;" it has been a real-world, natural fit illustrating the value of Narrow ID collaboration.

Not surprisingly, we have not found it as easy to think of many Broad ID partnerships in our work. However, one example does come to mind – the publishing of Ghassib's (2010) target article in a special issue of *Gifted and Talented International*. A physicist coming at things from a decidedly scientific, empirical perspective, Ghassib asked, "Where does creativity fit into a productivist industrial model of knowledge production?" It was not an easy question for the respondents, gifted educators all (with background in creative

studies), to tackle. It seemed to us, though, that once they began to consider another point of view, grapple with issues seen through a new lens, and synthesize their thoughts in different ways, the thinking of those respondents was, in fact, "stretched." One could feel original insights emerge and understand how incorporating different viewpoints from different disciplines into the traditional gifted backdrop might well be liberating, empowering, and highly transformative.

## The use of metaphor in ID work

In Ambrose's opinion, metaphor can and should be employed as an exploratory tool within and beyond our own discipline to build "conceptual bridges." Typically, one thinks of metaphors in the verbal sense – as being the province of language learning and English. And they can be compelling. Take, for example, the use of metaphor by children's and young adult fiction author, Stephanie S. Tolan (1996), who suggested that, deep down, a misunderstood gifted child might actually be "a cheetah." In her article, she went on to say, poignantly, "Schools are to extraordinarily intelligent children what zoos are to cheetahs." More than most other statements, this verbal description got us thinking about the struggles some gifted students face in school. In effect, the cheetah metaphor helped us relate to the plight of high-ability young people trapped in a lock-step system.

As well, scholars in science, math, and other disciplines routinely use visual metaphors to help sift and navigate their way through complex problems. Within GT education, Renzulli and his team have actually borrowed from science to create a visual metaphor to describe an effective method for engaging underachieving gifted children (Baum, Renzulli, & Hébert, 1995). Specifically, they trained teachers to use *Type III enrichment* – featuring activities in which students face real-world challenges, become actual investigators of higher-order problems, and target their work for real-life audiences (Renzulli, 1977) – with talented but underperforming kids. A complete discussion of the methodology and results is available in the original report. To summarize very succinctly, positive gains were made by virtually all students through their involvement in the *Type III* interventions (Baum, Renzulli, & Hébert, 1995). More to the point here, however, is the fact that the authors created a visual depiction, the Prism Metaphor for Reversing Underachievement, to describe and explain the findings. A slightly modified version of the Prism model, showing the full spectral array, is presented in Figure 1 (Renzulli, McCluskey, & McCluskey, 2014).

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A verbal description of the Prism approach has been written elsewhere (Renzulli, Baum, Hébert, & McCluskey, 1999):

> Whereas real images are formed when rays of light are reflected in a mirror, something quite different happens when light is passed through a prism. Not only does the light ray change direction, but it takes on qualitative differences that result in a spectrum of color critically different from the light energy that originally entered this special environment. Only to a certain extent do scientists understand and are able to explain what happens within a prism. Similarly, a 'mysterious phenomenon' happens when students pursue Type III enrichment experiences: They also change their direction and behavior patterns. We can only speculate about the combination of 'ingredients' that causes a turnaround within the enriched educational environment. Due to the idiosyncratic nature of Type III activities, the uniqueness of each learner, and the equally unique interaction between teacher and student, certain parts of the explanation for the positive changes may remain a mystery. No formula or prescription can be written that is appropriate for all underachieving students; however, we believe that the prism metaphor provides a

> grounded and positive signpost for reversing the pattern of underachievement through enrichment. (p. 222)

For us, however, the words pale in the face of the visual metaphor, which breathes life and vibrancy into the discussion. Quite simply, the visual enhances the verbal: it broadens our understanding, increases our empathy for underachievers, and sets the stage for productive intervention.

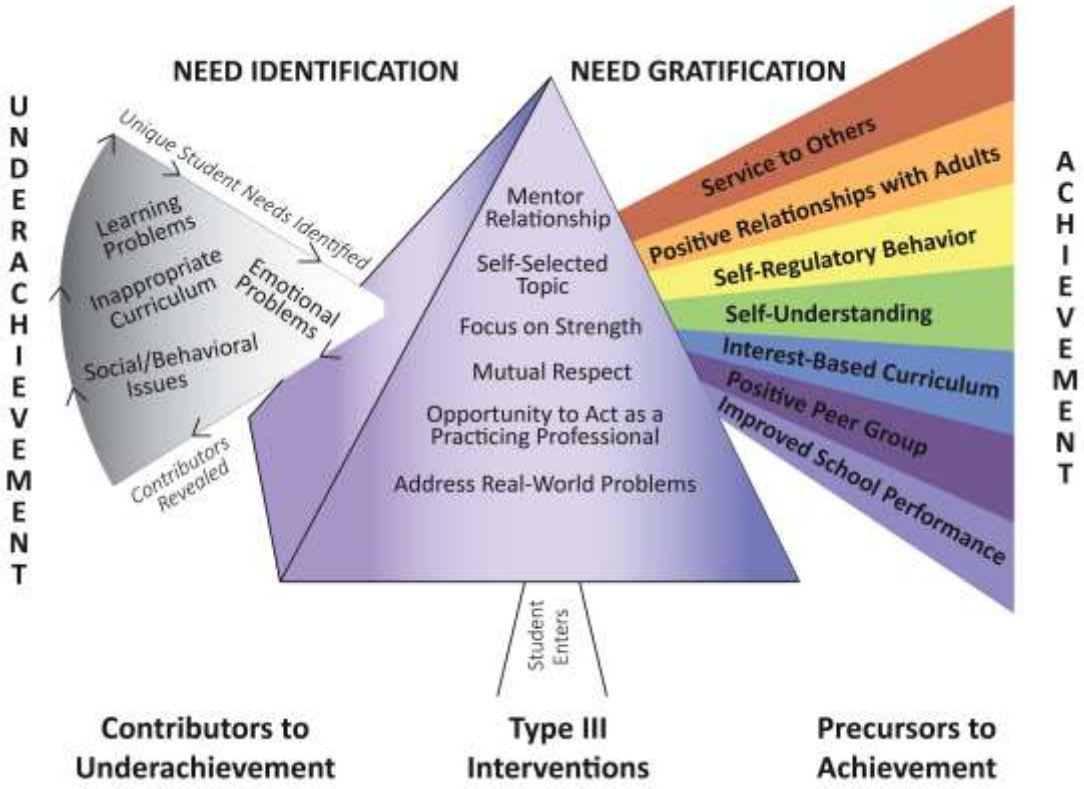


**Figure 1:** The Modified Prism Metaphor for Reversing Underachievement (Renzulli, McCluskey, & McCluskey, 2014). Adapted from the original model developed by Baum, Renzulli, and Hébert (1995). Used with permission of Winnipeg Education Centre (The University of Winnipeg) and the National Research Center on the Gifted and Talented (The University of Connecticut).

## Complexity, meaning, and dogma

True interdisciplinary collaboration is not easy; often, as Ambrose notes, it puts us at the edge of chaos. However, this uncomfortable "edge of chaos" state seems very much analogous to Vygotsky's (1987) "zone of proximal development," a place we want to be if we are to stretch our own thinking. Ambrose believes correctly that, as educators of the gifted, we ought to strive to locate ourselves on the chaos-order continuum and "nudge our complex, adaptive systems into the productive zone of complexity where chaos and order find exquisite balance …" And it is essential that we "appreciate the immense complexity of the phenomena we study." Of course, there is much to be said for elegant simplicity and making things understandable, but not if naive oversimplification and dummying down content are the result. The Amphitheater Model for Talent Development (McCluskey, Treffinger, Baker, & Lamoureux, 2013), described in the first issue of IJTDC, is sometimes criticized for being too complicated. We make no apologies, for it often takes a complex

model to help understand complex material. In our opinion, many popular frameworks are not sufficiently robust.

On the other hand, Ambrose sounds a note of caution; it is also possible to have complexity to no purpose – artificial, sterile methodologies celebrated for their rigour but lacking in meaning. A major strength of interdisciplinary collaboration is that it can assist those of us in gifted education to appreciate other ways of understanding and to avoid "obsessive pursuit of mechanistic empiricism while marginalizing all other forms of scholarship." Ambrose mentions Shapiro's (2005) "flight from reality," and how we must guard against "falling in love excessively with the rigor of our methodology" and "overvaluing quantitative empiricism." We categorically concur. We simply must not allow definitions, theories, and research methods to trump purpose or we will end up with the "sterile certainty" Byers (2007, 2011) decries.

Further, according to Ambrose, we must also guard against academic hubris and dogma: "There can be powerful, even devastating consequences when a field becomes theoretically dogmatic." He even observes how "the insular dogmatism of the rational actor model in neoclassical economics encouraged the financial industry to engage in questionable practices that precipitated the 2008 economic collapse …"

In Ambrose's view, if we are able to embrace cognitive diversity, contend with the accompanying ambiguity, and break free from our respective specialty silos, cross-disciplinary collaboration will help us address many of the foregoing issues. And groupthink notwithstanding (Janis, 1972), it is often the case that two or more properly screwed on and focused heads are much better than one for solving complicated problems. Ambrose speaks to the value of "a diverse, interdisciplinary international group of individuals coming together and coalescing around a problem in a field." Again, this is a major goal of ICIE's mission in general and the purpose of this issue of IJTDC in particular. As Don Treffinger has remarked, the only constant in the new order will be constant, accelerating change. We will cope with such change better in our complex, globalized world if we emerge from our respective cocoons, view things more flexibly, and work together.

## Morality, values, and ethics

Ambrose believes that many talented people achieve personal success at the expense of others and of society. And looking back to 1975, one of the major conclusions to arise from the First World Conference on Gifted Education in London was that high-ability individuals whose needs are not met may become severe social problems (McCluskey & Walker, 1986). The laissez-faire (or should we say lazy-unfair) attitude that a gifted child will somehow "make it on his or her own" was challenged; in fact, there was speculation that many unsolved crimes have been committed by gifted individuals (who made it on their own alright, but not precisely in a socially desirable manner).

Ambrose goes on to paraphrase the military historian, Andrew Bacevich (2012), noting how "otherwise gifted, intelligent leaders can become dogmatic warmongers who push their societies into morally reprehensible conflicts with devastating consequences." Bacevich apparently identified implications for gifted leadership. So should we all, for unethical leaders can, as Ambrose emphasizes, manipulate followers to engage in murder, genocide, and other forms of horrific evil. Sadly, we see it all around us today.

Ben Franklin said wisely, "It is a grand mistake to think of being great without goodness." We would do well to heed those words, attend to the warnings concerning misdirected talent (Ambrose & Cross, 2009), and give some thought to injecting the teaching of values clarification and ethics into gifted programming.

## Social justice and equity

Despite the popular myth of equal opportunity, society's playing field is by no means level. The pointed comments by Kristof (2013) ring true:

> Point to a group of toddlers in an upper-middle-class neighborhood in America, and it's a good bet that they will go to college, buy nice houses and enjoy white-collar careers. Point to a group of toddlers in a low-income neighborhood, and – especially if they're boys – they're much more likely to end up dropping out of school, struggling in dead-end jobs and having trouble with the law. Something is profoundly wrong when we can point to 2-year-olds in this country and make a plausible bet about their long-term outcomes – not based on their brains and capabilities, but on their ZIP codes. (p. A4)

Recently, two members of our *Lost Prizes* team – reclusive types who passed up attending their high school reunions – nonetheless began to consider how their classmates had fared in life (Bergsgaard & McCluskey, 2013). Both concluded, independently, that the place individuals arrived at in the larger society bore more than a faint resemblance to the place they had held in their first-grade reading groups. The observations were strikingly similar to Kristof's:

> In retrospect, we realized the career paths and lives of our former classmates were terribly predictable. Essentially, those high school students whom we remembered as coming from upper socio-economic backgrounds and homes where the parents were active in their children's lives and in the community held more prestigious jobs today. The in-group in high school was still the in-group decades later, and those who had languished near the bottom of the social ladder in school were almost uniformly in lower-paying and less highly regarded occupations.
>
> Of course, there were a few exceptions. There almost always are, and those exceptions have long been used as evidence that rich kids can come to a bad end and poor kids can rise to the pinnacle of our society. But despite these aberrations, our own 'deep attention' to the 'everyday' brought us to the conclusion that wealth begets wealth and poverty predicts poverty. Affluent people network with other affluent people, while those living in poverty tend to interact with others of similar socio-economic status. (p. 210)

Others share this view. Hedges (2009), for example, has strong opinions about time-honoured social structures that pave the way for some and create roadblocks for others:

> The real purpose of … richly endowed [Ivy League] schools is to perpetuate their own. They do this even as they pretend to embrace the ideology of the common man, trumpet diversity on campus and pose as a meritocracy. … at the elite institutions, those on the inside are told they are there because they are better than others. Most believe it. They see their money and their access to power as a natural extension of their talents and abilities, rather than the result of a system that favors the privileged. … The elites vacation together, ski at the same Swiss resorts, and know the names of the same restaurants in New York and Paris … they speak an intimidating language of privilege, complete with references to minutiae and traditions only the elite understand. They have obtained a confidence those on the outside often struggle to duplicate. And the

> elite, while they may not say so in public, disdain those who lack their polish and connections. (p. 98-100)

The biases can be extremely subtle. In education, for example, it is not uncommon for teachers and other caregivers to automatically and unconsciously label at-risk kids and their families who are at the lower end of an artificially imposed social spectrum. Several philosophers have asserted that our schools are far from just and effective. And Paulo Freire (1985) has admonished defenders of the status quo by noting, "Washing one's hands of the conflict between the powerful and the powerless means to side with the powerful, not to be neutral" (p. 122). Are we in gifted education part of such inequity?

Many of us in the gifted world state, often rather ritualistically and self-righteously, something to the effect that "Gifted programs are not undemocratic; the absence of them is." We often go on dogmatically to insist it is not at all elitist to attempt to identify and develop the talents of gifted learners. We ourselves have made such statements, and believe them … providing all children have equal opportunity to have their talents identified and nurtured. But do they? Or are our social structures arranged in such a way as to give some a definite edge while disadvantaging others? If this is so, might we in the gifted movement indeed be elitist? It's a painful but necessary thought, and one that is likely voiced more often in disciplines other than our own.

Consider, as an example, the IQ tests that are so frequently used to identify high-ability students, including the so-called "profoundly gifted." Most tests of this type are clearly biased, emphasizing, as they do, verbal skills such as vocabulary, basic facts, comprehension, and the like. A child who grows up immersed in books, in a home where discussion and education are valued, has a distinct advantage on such tests over one who does not have these opportunities. The unfair advantage is present in the nonverbal realm as well: witness the fact that some kids are exposed to all kinds of puzzles, mazes, blocks, and find-the-missing-item (or hidden Waldo) books, while others are not. Since these sorts of tasks are part and parcel of most IQ tests, one must ask, what is being measured here … Ability or background? Intelligence or past experience?

More than four decades ago, in an attempt to give African American students an even break, Robert Williams (1972) created the Black Intelligence Test of Cultural Homogeneity, or BITCH-100. Noting that traditional IQ tests favour young people from White, mainstream, middle and upper middle class families, he designed his inventory – facetiously also called the Black Intelligence Test Counterbalanced for Honkies – so that it focused on the language, lifestyle, experience, and attitudes of Black students. Not unexpectedly given this emphasis, Black high school and college students clearly outperformed their White counterparts.

It only makes sense. Let's take an example of three potential Mozarts. Potential Mozart #1 is born into a wealthy home – he goes to private school, where his father is chairman of the board and his mother a leader on the PTA. From the get-go, Mozart #1 exhibits tremendous musical talent, composing his own pieces on the family's grand piano. He is given music lessons, encouragement, plenty of time to practice, and the chance to celebrate his talent by performing at home and at school recitals. Potential Mozart #2 doesn't have it quite so good. Still, his musical talent surfaces at school and on his family's second-hand piano. His parents, who know and socialize with several of their son's teachers, are delighted and they too provide lots of encouragement. And they begin

saving for a baby grand, which will be acquired fairly quickly. Now let's think about Potential Mozart #3, living in poverty in the inner city. His mother and father don't have as much time for him as they might like, simply because they must work long, hard hours and concentrate on day-to-day survival. There is no piano in the home; the parents would be hard-pressed to purchase sheet music. They have no connection with, and actually avoid the neighbourhood school. Mozart #3 loves music, and can play songs by ear whenever he gets a rare opportunity to have a quick turn on the school piano. Clearly, though, there is little likelihood that his talent will even be noticed, yet alone nurtured. Political advocates, philosophers, child and youth care workers, and front-line people in at-risk education give much of themselves in an attempt to better the lot of disadvantaged populations. Perhaps those of us in gifted education can reach out further, hear the concerns, and do a better job of seeking out our Potential Mozart #3s.

The facts are clear – traditional approaches to the identification of gifted students frequently exclude many disadvantaged young people who have been systematically marginalized for a variety of reasons. Behaviourally difficult, relationship-resistant young people do not usually find their way into enrichment programs, which tend to be reserved for the teacher pleasers (McCluskey, Treffinger, Baker, & Wiebe, 2016).

The same is true for children of poverty (Renzulli & Park, 2000), and for youngsters from minority groups (Sisk, 1993). As well, the abilities of those who turn to criminal and gang activity often go totally unrecognized. Yet it takes talent to become a successful member or leader of a youth gang. Baker, McCluskey, and McCluskey (2003) have asked, Should gangs be considered a "cesspool or talent pool?" Life in a gang is destructive, wrong-headed, evil at times, and likely to end badly for those involved. Still, not just anyone can survive in this sort of setting.

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In *Double Deuce*, one of his fictional *Spenser* mysteries, Robert B. Parker (1993) offered the following description of youth gang members:

> They are often quite ingenious. They function barely at all in school, and the standard aptitude tests seem beyond them, and yet they are very intelligent about surviving in fearful conditions. They are often resourceful, they fashion what they need out of what they have. They endure in conditions that would simply suffocate most of the Harvard senior class. (p. 150)

There are monetary costs when we fail to identify and develop such talent, along with the less quantifiable social cost of what might have been:

> What is the cost of a symphony unwritten, a cure not discovered, a breakthrough not invented? In today's complex world, and in preparing for tomorrow's certainly more complex one, we can scarcely afford such waste of 'talent capital' and human potential. (McCluskey & Treffinger, 1998, p. 216)

Due to unfortunate life circumstances, the abilities of at-risk students are all too often missed, masked, or ignored simply because they and their families lack the social and cultural capital that sets the stage for success in school and in later life (Bergsgaard & McCluskey, 2013). The challenge obviously becomes identifying talent in unlikely settings and redirecting it into appropriate and productive pursuits. We should be expanding our identification process by "looking for gifts in all the wrong places" and seeking out the hidden, disguised, dormant talents of disconnected underachievers, children and youth not of the dominant culture, disadvantaged young people, students in special education classes, and youth in correctional facilities (McCluskey, 2005).

In the target article and in earlier work, Ambrose (2009) quite rightly goes after the notion of "unearned merit" with a vengeance, indicating that many educators mistake inherited privileged status for talent. He stresses that there are "powerful, socioeconomic barriers to the discovery and development of high ability among deprived populations, especially in the most stratified nations such as the United States," and that, in keeping with attribution theory, "the underachievement of deprived populations would more likely be viewed as personal failings of individual children and unsupportive families instead of the egregious effects of dogmatic policymakers and deceptive market fundamentalists" (Ambrose, 2005, 2008, 2012).

Without equality of opportunity, the situation is indeed undemocratic. Hearing the voices of scholars and practitioners, from within and outside our field, who are questioning some of our assumptions and practices might inspire us in gifted education to be more mindful about fairness in identifying and developing talent. For example, using the model of democratic erosion as the lens can help us "recognize the distortion of aspirations among the privileged gifted and the crushing of aspirations among deprived, gifted young people" (Ambrose, 2005; Yamin & Ambrose, 2012).

## A response from University of Winnipeg (UW)

On a personal and current note, the first author of this piece, as Dean of Education at UW, along with the Associate Dean, John Anchan, have recently had occasion to think about interdisciplinary collaboration in practice. We preside over a five-year integrated program, from which our students graduate with two degrees: the B.Ed. and a B.A. or B.Sc. Until now, tenure and promotion of professors was dealt with by a large, 9-person Faculty Tenure and Promotion Committee made up of members from across various disciplines within the institution. In Education, we lamented the fact, with good reason, that we were terribly underrepresented; that we didn't have enough control; and that other Faculties didn't understand the subtle nuances involved or what it meant to be part of a professional teacher preparation program. It grated on us.

As a result of our latest Collective Agreement, however, there are now smaller 5-person Tenure, Promotion and Continuing Appointment Committees for each individual Faculty (with the Deans choosing three of five faculty members nominated by the Department Personnel Committee, and selecting two "nucleus members" on their own). So tenure and promotion have become more an in-house matter, with each Faculty having autonomy and control of its own process. Now, however, having read and considered Ambrose's target paper, and the target articles of Ghassib and others, we have rethought the situation. That is, after finally being granted the power to create a committee exclusively for Education, we find we don't want to go this route. Instead, we have moved this discussion beyond theory by appointing, as nucleus members, faculty from our closely allied disciplines of English and History. For Education to hear those other voices is an example of Narrow ID, where judicious interdisciplinary collaboration has begun without pushing the envelope too far too fast. A little down the road, though, our intent is to reach out to the sciences and other more distant disciplines in Broad ID fashion. In other words, we're taking smaller steps, and setting the stage for success before getting real "stretchy." As time goes by, both Narrow and Broad ID will be actively used to help us avoid the trap of becoming too insular.

## Final thoughts

We join Ambrose in asking, Does 'all of the above' magnify the importance of teaching ethics in gifted education? For us, the answer is a clear "You betcha!" And does this mean gifted educators should move towards more interdisciplinary collaboration? We say, "Yes – with alacrity!" It's essential we reach out, in true interdisciplinary fashion, to colleagues in other fields. Such collaboration can only augment our knowledge, stretch our thinking, and enable us see more clearly and react more meaningfully.

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**From the Editor's Desk:**

# Innovative Pathways and Possibilities: A Vision for Creative and Transformative Learning

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*"To see a World in a Grain of Sand*
*And a Heaven in a Wild Flower,*
*Hold Infinity in the palm of your hand*
*and Eternity in an hour."*
(From: Auguries of Innocence, William Blake, 1757-1827)

**Keywords**: Creativity; Transformative and visionary education; Innovation in education; Finnish education; Interdisciplinary approaches to teaching and learning; Perspectives and philosophies of teaching; Social justice education.

A common theme that unites the articles that form this special issue of ICIE is the potential for education to help individuals open themselves to new possibilities for learning in rapidly changing social and global contexts. The issue addresses the transition from theorizing about "education" to understanding the unique processes of *learning* within complex and multi-layered contexts. Exploring conceptions of gifted and talented education from the landscape of different disciplines can inform and enrich our understanding of the cognitive and affective dimensions of learning. Campbell (2015) draws upon the work of Thomas Kuhn to highlight the paradigm shift in research over the decades:

> The move from modernity to post-modernity, from nationalism to globalization, from cultural supremacy of one group over others to the concept of multiculturalism and the acknowledgment of cultural diversity, from the understanding of one faith and its dominance in society to acceptance of multi-faiths, are some of the major changes taking place in the world in which we live. (p.15)

The response to Dr. Don Ambrose's "Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundations for Gifted Education" will provide education practitioners and theorists with valuable insights into the way that sociocultural and geopolitical contexts influence the development of interdisciplinary research in gifted and talented education. This special issue includes theoretical analyses and grounded research that address the promise and challenge of interdisciplinary approaches to understanding conceptions of talent and giftedness. Some of the articles focus on teaching and learning styles, teaching creatively, innovative learning projects, and the professional development of educators. While not a direct response to Ambrose, a few of the articles address complementary and timely issues related to his focus paper.

Over the course of time, notes Ambrose (this issue), "academic disciplines claimed territory, staked out borders, and built epistemological and even ontological domain-protecting fences on that terrain where the phenomena that interested them reside." However, as educational issues become more complex, an interdisciplinary approach "might expand and clarify our notions of cognition and expertise among the gifted" (Ambrose, 2016, this issue).

Gardner (2011) asserts that a solid foundational knowledge in constituent disciplines is a prerequisite to developing thoughtful and "deeper level" transdisciplinary work. Ambrose further notes that "we need to explore and to appreciate the structures and dynamics of diverse disciplines to understand the connections between domain specificity" and interdisciplinarity. How can we be enriched by interdisciplinary approaches without comprising deeper level knowledge acquisition in specialized fields? How can we winnow out common threads in fields such as genetics, endocrinology, linguistics, neurobiology, philosophy, and psychology as a way to enhance and further inform our conception of creativity and critical thinking, for example (Ambrose, 2016)? What are the implications of these expanding boundaries for understanding the foundations of teaching and learning in today's linguistically and culturally diverse classrooms? What are the practical applications of these perspectives in terms of effective teaching styles, incorporating creative learning strategies and assessment approaches, and in understanding dimensions of literacy, intelligence, and creativity?

In *Most Likely to Succeed: Preparing our Kids for the Innovation Era*, Tony Wagner and Ted Dintersmith (2015) write that "an overarching goal of education should be to immerse students in the beauty and inspiration of their surrounding world" and that "to make real progress in preparing all students to succeed in the twenty first century, schools need to tap into the passions of students, help them develop critical skills and decisive life advantages, and inspire them" (p.50). A holistic education, ideally, should prepare individuals to be successful in careers, citizenship, and life. Self-knowledge and learning how to learn in addition to integrating the creative arts throughout the curriculum should take precedence over "teaching to the test," measuring fixed learning outcomes, and rigidly separating "academic" and "vocational skills." While the authors present profiles of successful and innovative schools in North America, they believe that many educational initiatives today (e.g., *No Child Left Behind, Teaching to the Common Core, 21st Century Learning, and Success for All Learners*) are misguided and lacking in innovation. The value placed upon "elite" white-collar education based on abstraction and symbolic manipulation while experiential and vocational learning are minimized may perpetuate existing inequities and work to further alienate vulnerable children and youth, posit Wagner and Dintersmith. Rarely is the school looked at from the lens of its "own community" within a unique context.

The authors contend that as "innovation races ahead" the creative competencies of our students often lie dormant:

> Today's youth live in a world brimming with opportunity. Some will create, catalyze, and capitalize on a dynamic world hungry for innovation. Others will be left behind. Students who only know how to perform well in today's education system---get good grades and test scores and earn degrees---will no longer be those who are most likely to succeed. Thriving in the twenty-first century will require

real competencies, far more than academic credentials (Wagner and Dintersmith, 2015, p.10).

In *The Global Achievement Gap*, Wagner (2008) suggests that a skills-based rather than subject based assessment would explore:

- Critical thinking and problem-solving;
- Collaboration across networks and leading by example;
- Agility and adaptability;
- Initiative and entrepreneurship;
- Effective oral, written, and multimedia communication; and
- Accessing and analyzing information.
- Curiosity and imagination (Wagner, 2008 cited in Wagner and Dintersmith, 2015, p. 10).

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The authors suggest that the mastery of core academic content would be a means to enhance the development of the above skills. For example, 21st century mathematics skills needed to be successful involve creative problem-solving, complex pattern recognition, and the ability to utilize statistics and complex quantitative data to synthesize information. In 21st century science education, skills needed to succeed would include an understanding of how the world works, being able to form and test scientific hypotheses, asking insightful questions, designing useful experiments, applying principles across the disciplines, and developing scientific creativity. In Linguistics and English language arts, 21st century skills to succeed would involve proficiency in speaking, intercultural intelligence, and reading a wide variety of written texts (novels, poems, plays, essay, news) in critically reflective ways. Asking thoughtful questions, engaging in constructive debates, forming independent perspectives, and communicating effectively across multiple genres, media forms, and styles are also component parts of essential literacy (Wagner and Dintersmith, p.118-119). Literacy is dynamic, lifelong, and varies depending on the cultural context as well as individual needs and interests (Magro, 2006/2007).

Wagner and Dintersmith (2015) comment on the inspiring model of Finland's education system. Interestingly, the Finnish educational system has drawn progressive and experiential learning models emerging in the United States and England in the first part of the 20th century. Sahlberg comments that "many visitors from the United States note that what they see in Finnish schools reminds them of the practices they had seen in many schools in the United States in the 1970s and 1980s!"(p. 17). The emphasis placed on creativity, freedom, and self-direction which are valued in the Finnish system are highlighted in John Dewey's (1938/1997) *Experience and Education*, A.S. Neil's *Summerhill* (1993/1960) and Carl Roger's (1969) *Freedom to Learn*. In essence, these seminal texts highlighted the importance of learner choice, creativity, self-direction, critical thinking, and interpersonal effectiveness.

Neil and Rogers critiqued the regimentation of conventional educational contexts and instead, advocated for the importance of alternative learning spaces where experiential and project-based learning could occur. The teachers would be more of a co-learner, mentor, guide, and facilitator. In his chapter "A Plan for Self-Directed Change in an Educational System," Rogers writes that the teacher would be able to "accept the innovative, challenging, 'troublesome' creative ideas which emerge in students, rather than reacting to these threats by insisting on conformity" (Rogers, 1969, p.112). Classrooms would "be conducive to spontaneity, to creative

thinking, to independent and self-directed work" (Rogers, 1969, p.112).

The success of Finland's education system has been attributed to numerous factors. These include the high quality teacher graduate education program and the value placed on teaching as a profession. In addition, a high value is also placed on vocational education as a respected path to a career (Sahlberg, 2015; Verma, 2014). Learning is personalized and there is a high expectation that students will take ownership of their own learning goals. Self-directed and collaborative ways of knowing are encouraged. An importance is placed on unstructured play, creativity, and imagination.

Less formal testing is mandated and the integration of arts and crafts throughout the curriculum is highlighted. Sahlberg (2015) writes that there is the recognition that a preoccupation with testing does not necessarily lead to learning. On the contrary, testing and the continual preparation for future tests and entrance exams can erode creativity, heighten deleterious anxiety, and create a "fixed" rather than a "growth" mindset (Dweck, 2012; Sahlberg, 2015).

Finnish teachers are also encouraged to be creative. They are given more freedom to create their own professional development and, regardless of what grade they teach, teachers must hold at least a Master's degree. "There is no regular standardized testing, school inspection, teacher evaluation, or ranking of schools in Finland" (Sahlberg, 2015, p.117). The high quality teacher graduate education program and the value placed on teaching as a profession as well as the value placed on vocational education as a respected path to a career contribute to the overall success of Finland's educational systems. "Young Finns gravitate toward teaching because they regard it as an independent, respected, and rewarding profession within which they will have the freedom to fulfill their aspirations" (Sahlberg, p.133). Teachers are viewed as catalysts of change, reflective practitioners, specialists and experts, facilitators, co-learners, and researchers. The "reflection-in-action" model of teacher education ensures that teachers in Finland become keen observers of their own teaching style and the way each student learns. Versatility in teaching strategies and a conscious effort to diversify their strategies and approaches to holistic assessment are valued.

Pasi Sahlberg's (2015) *Finish Lessons 2.0* outlines the stages and phases of Finland's innovative approach to *peruskoulu* or the 9-year comprehensive basic school system. Sahlberg explains the transformative approach to educational policies and practices helped Finland recover from the severe economic recession in 1993. "The phase of educational change in Finland has been characterized as a time that challenged conventional beliefs, searched for innovation, and increased trust in schools and their abilities to find the best ways to raise the quality of student learning" (Sahlberg, 2015, p.45).

The "reform policies" appear paradoxical as they are distinctly different from the global educational discourse that emphasized "hard-hand control, more data, tougher accountability, and harder work from all involved in schooling" (p.55). There was the recognition that "the knowledge economy is not only about preparing human capital for higher know-how; it is also about having highly educated and critical consumers who are able to benefit from innovative technological products in markets that require better technological literacy" (p.154).

In his section "Foreign Innovation, Finnish Implementation" Sahlberg (2015) details the way that Finnish schools have integrated and built upon five American educational ideas:

1. **John Dewey's Philosophy of Education** and the emphasis on education for democracy by encouraging students' ability to make decisions about their learning preferences and their career trajectories;
2. **Cooperative Learning** and the development of a curriculum that embraces constructivist educational principles;
3. **Multiple Intelligences** and the integration of Howard Gardner's (1983) emphasis of a broader conception of talent and intelligence. Students are encouraged to be self-directed and the holistic balance of academic subjects with art, music, crafts, and physical education is encouraged;
4. **Alternative Classroom Assessments** that personalize learning and that encourage portfolio assessment, performance assessment, self-assessment and assessment for learning, and an assessment of learning styles and strategies; and
5. **Peer Coaching** as a confidential process where teaching colleagues can expand and build on their repertoire of teaching and learning strategies and approaches in a non-threatening context. Problem solving, the exploration of new ideas, feedback, reflection, and the implementation of innovative techniques are accepted as an important part of teachers' professional and continuous learning (pp.167-169).

A more open flexible and dynamic learning environment would also take into account alternative instructional groups and teaching strategies that would better meet the needs of individual learners. The "dominance of classroom-based seatwork" has been transformed into more inquiry-based experiential learning projects that challenge students to view the broader community as a site for learning. If a student is experiencing problems in reading, writing, or mathematics, for example, intensive special support is available. "During their 3-year lower-secondary school, all students are entitled to 2 hours a week of educational guidance and counselling. This reduces the risk that students will make ill-informed decisions regarding their further studies" (Sahlberg, 2015, p.33).

Learners have opportunities to develop emotional intelligence skills such as building self-awareness and empathy, creative problem solving, developing the art of collaboration, and communicating effectively. The architecture of modern Finnish schools is designed to accommodate different learning contexts for self-directed and collaborative learning. The openness of architectural space lends itself to play, contemplation, collaboration, inspiration, and imagination. Finally, access to high quality education for all, lifelong learning and adult education is the norm in Finland. Becoming literate is associated with rights, responsibilities, and democratic participation. The Canadian journalist Sonia Verma (2014) writes: "The Finnish system flies in the face of the logic that poor student performance can somehow be cured by increasing class time…In Finland, students don't begin school until the age of 7, the school days are shorter and students are almost never given homework…. Finnish students experience less anxiety than their peers in other countries. Children are neither coddled nor condescended to. They are expected to take an active role in their learning" (p.2). Parallels are made between Finland's educational programs for K-12 youth and the Montessori experience; indeed, Wagner and Dintersmith (2015) posit that the Montessori experience mirrors what adults do in innovative organizations:

> Montessori emphasizes collaboration, communication, self-direction, and risk-taking. There are no grades or tests, but teachers and other students give informed feedback. Kids take the lead in defining their goals, exploring passions, and learning about the world. It's an environment of discovery, of inquiry, of working

> on something for long blocks of time instead of shifting gears every forty-five minutes. And kids are encouraged to take chances, fail, and iterate to end goal of importance (p.85).

How elusive is the development of a creative climate for learning (*at all levels*) today? To what extent are teachers today encouraged to take risks, think creatively, and act courageously? What barriers need to be reduced or removed so that educational systems can be dynamic, innovative, and transformative?

## Transformative Learning Theory and links to interdisciplinarity

Transformative learning theory provides a useful theoretical paradigm to understand and further explore the intersection of cognitive, affective, intuitive, creative, and imaginative dimensions of learning (Magro, 2001; 2009). This theory also shares many parallels with creative learning processes. Transformative learning theory can help educators understand the way the cognitive and psychological dimensions of learning interact to help individuals develop more comprehensive and inclusive meaning perspectives (Magro, 2001; Mezirow, 2000; Taylor, 2008; Taylor and Cranton, 2012). Transformative learning is about "change-dramatic, fundamental change in the way we see ourselves and the world in which we live" (Merriam, Caffarella, & Baumgartner, 2007, p. 130). Cranton (2006) writes that "transformative learning is a process of examining, questioning, validating, and revising our perspectives" (p.23). In essence, transformative learning is a "deeper level" learning that may result in a paradigm shift in the way an individual sees themselves and their world. Through reflection, critical discourse individuals may "reappraise" assumptions, misperceptions, and beliefs previously held. Learning not only involves gaining new information, but there is a fundamental shift in beliefs, values, and ultimately the actions of an individual (Mezirow, 1990). The transformative learning classroom provides an inclusive and open learning environment that welcomes and appreciates diversity, dialogue, multiple ways of knowing, the complex examination of issues, and perspectives taking. The teacher can play a vital role in creating a psychological and intellectual climate that fosters creative and critical thinking. Teachers, for example, who possess emotional intelligence qualities such as empathy, intercultural sensitivity, and self-awareness are more likely to foster.

Too often, notes Peter Mayo (2003), the discourse in education has projected the image of learners as "two-dimensional beings, namely as consumers and producers" (p.42), rather than empowered and enlightened individuals who can make a positive contribution to our world. Mayo (2003) argues that the fragile state of the world today places an even more urgent imperative on educators to create a context for learning that is hopeful and transformative. We should be motivated by a positive vision of "what should and can be" (Mayo, 2003, p 42). Mass impoverishment in various parts of the world, the ever-widening gap between North and South and the 'have and have not societies', the ongoing refugee crisis, planetary devastation, and the "persistence of structures of oppression in terms of class, gender, race, ethnicity, sexuality, and ability/disability," note Mayo, are all the more reasons to "retain an emancipatory vision of education, one that reflects the will to contribute to the creation of a world" which is less cruel and inhumane ( p.42). Along similar lines, O'Sullivan (2002) writes that "rootlessness, transitoriness, and dispossession are the fallout of globalization" and that "our sense of belonging to a stable community and our security are lost in the shuffle of accelerated change and mobility" (p.9). O'Sullivan advocates for transformative educational initiatives at all levels that would foster a community's sense of place. Disciplines would be connected to students' lives in creative and meaningful ways. Subjects would not be disconnected but rather they would be interconnected in ways that students could explore the relationships between mathematics, art, environmental sciences,

history, and literature, for example. A transformative curriculum might include "bioregional studies":

> Bioregional study would encompass study of the land, the history of the community that has occupied a region, and the histories of people in a bioregion. Educating for the purpose of cultivating a sense of history of an area would enable people to have loyalties and commitment to the place of their dwelling....A transformative vision of education should be built on the foundational processes of the universe---differentiation, subjectivity, and communion. The creativity of the community must be grounded in an awe and respect for the larger biotic community—the web of life (O'Sullivan, 2002, pp.9-10).

Transformative education is rooted in social justice and a positive vision of the future (Mayo, 2003; Taylor and Cranton, 2012). Social justice education aims to explore the complex intersection of class, gender, race, ethnicity, and other forms of social differentiation that work to create cultures of exclusion and inequity. In being more aware of explicit and implicit forms of oppression, school leaders can become advocates for educational changes that can make a positive difference in the lives of traditionally marginalized and oppressed students (Jean-Marie, Normore, and Brooks, 2009). The voices of students who are often underrepresented in the educational system must be heard if transformative change is to occur. Jean-Marie, Normore, and Brooks highlight the importance of drawing from the knowledge base of different disciplines as a way to enrich and inform the way social justice and transformative educational leadership can develop. They refer to the way sociology, psychology, cultural studies, peace studies, anthropology, philosophy, human geography, and comparative and international education can offer a rich theoretical and literature base that can provide a "foundation for radical innovation in both the research and practice of educational leadership---it could also be the intellectual scaffold on which a theory of social justice is ultimately built" (Brooks, 2008, p.1). How can philosophers, sociologists, political scientists, and legal scholars inform educational inquiry and practice?

Paulo Freire (1998/1972) captures the interconnection of creativity, transformative inquiry and democratic participation in explaining that "knowledge emerges only through invention and re-invention; through the restless, impatient, continuing hopeful inquiry human beings pursue in the world, with the world, and with each other" (p.53). Learning in this context is not linear and static, but rather it is multi-faceted and dynamic; emotional, spiritual, and cognitive ways of knowing are integrated and interrelated. Dirkx (2006) writes that "transformative learning involves the self in an intense process of meaning making that reflects the person's relationships with both the self and his or her sociocultural context. While at once deeply personal, transformative learning also engages the learner in social and collaborative relationships with others" (p.47). Personal agency and empowerment, democratic discourse, an awareness of critical issues that endanger world peace and environmental sustainability are themes that reoccur in various strands of transformative learning theory (Taylor and Cranton, 2012; O'Sullivan, Morrell, & O'Connor, 2002). Hamilton (2007) writes:

> We come to understand ourselves by making meaning of our experiences. In everyday life, we habitually reinforce and extend this meaning through the exercise of our values, assumptions, beliefs, and practices. Sometimes, we experience circumstances that cause us to question these perspectives and beliefs. Transformative learning happens when we are able to act differently as a result of a shift in perspective, questioning of assumptions, or the re-examination of beliefs. (2007, p.2).

Interestingly, many of the approaches, teaching strategies, and ways of viewing learning found in both the literature on social justice education and transformative learning reflect many of the concepts of creative learning (Isakson, Dorval, & Treffinger, 2000; Sternberg, 2003; Tsai, 2013). Understanding problems, exploring alternative solutions, generating new ideas, reflection, feedback, and brainstorming, evaluating options, and implementing new ideas reflect the 10 stages of transformative learning that Mezirow (2000/1981) articulates:

1. A disorienting dilemma;
2. Self-examination with feelings of fear, anger, guilt, or shame;
3. A critical assessment of assumptions;
4. Recognition that one's discontent and the process of transformation are shared;
5. Exploration of options for new roles, relationships, and actions;
6. Planning a new course of action;
7. Acquiring knowledge and skills for implementing one's plans;
8. Provisional trying of new roles;
9. Building competence and self-confidence in new roles and relationships; and
10. 10. A reintegration into one's life on the basis of the conditions dictated by one's new perspective (Mezirow, 2000, p.22).

Creative problem solving involves re-examining assumptions and perspectives, thinking "outside the box" and being open to new ideas and experiences. Personality qualities associated with creative individuals involve a tolerance for ambiguity, curiosity, and the ability to see complexity in understanding issues and in solving problems. Creative individuals are energetic, self-directed, and intrinsically motivated (Sternberg, 2003). To what extent do teachers role model these qualities in the classroom? How open are teachers to exploring innovative strategies that challenge students to think in creative and divergent ways?

Kelly and Minnes-Brandes (2010) contend that teachers are non-neutral agents of social change and that teaching for social justice and transformative learning involves: 1) critically analyzing social and institutional inequities; 2) Taking into account how positions of privilege and oppression shape pedagogical decisions; and 3) linking deliberate inquiry to working toward social justice. Course content and teaching strategies focus on inquiry based learning projects, debate, literature circles, storytelling, reflection and discussion, case studies, and creative arts based projects involving drama/role play, and service work (Magro, 2011). Social justice themes that may be addressed in courses such as English language arts, history, world issues, and psychology include examining the roots of violence and poverty, the marginalization of individuals in our society who have mental health problems, cultural imperialism, and the link between marginalization and powerlessness. Collaborative learning can encourage perspectives taking and deeper level analysis, comparison, and integration of ideas from multiple sources. Self-directed learning projects can encourage intrinsic motivation and self-efficacy. The students "co-create" the curriculum with the teachers; the teacher is more of a challenger, an advocate, co-learner, facilitator, and artist/visionary (Magro, 2011). The teacher is adept in assisting students to see connections between their own lives and issues of power and privilege, exclusion and inclusion, discrimination and racism, and ways to build a world that is more peaceful and sustainable. Learning, from the teachers' standpoint, should not only inform, inspire, and uplift their students, but it should also encourage them to challenge the status quo. Creative writing, for example, is viewed by

English language arts teachers as an opportunity to encourage reflection, introspection, and critical analysis of timely issues such as human rights, the refugee crisis, and ways to promote peace at the community and global level. The following excerpts from my own qualitative research studies exploring teachers' transformative learning echo these points:

> Social justice to me involves identifying the hypocrisy and contradictions in our society. What do we mean by "a war on terror"? My students can see these contradictions. As a teacher, you are helping individuals understand their world. Teaching English language arts has the potential to be transformative if teachers are knowledgeable and willing to take risks. There is a depth and richness in literature that is ideal for exploring social issues such as crime, poverty, and marginalization. I want to burst my students' bubble of comfort, so to speak. We still live in a have and have not society. Why? I want my students to investigate that question. I teach books that appeal to young people; the protagonists in novels like "Night by Elie Wiesel, and "The Road" by Cormac McCarthy," involve young adults facing a society with arbitrary rules. They are the outsider. These novels are disrupting, but in a positive way. The word is a microcosm of the human world. We use language to express emotional and if I can help my students develop self-awareness and self-expression, I feel that I am making a difference. I also give my students independence in choosing novels and writing projects to work on; this term, some of my students have already read 10 books! I encourage writer's notebooks interactive technology, book talks, debates, and creative writing.
>
> School architecture is of interest to me. We need to consider new spaces for learning that enable students more freedom to design their own schedules of learning. They need to be able to move from a smaller class to a larger forum with greater ease. Teaching is learning and we need to personalize learning more. I have worked as a resource teacher and as a regular classroom teacher and I have learned that thinking processes are very unique; I often ask myself-'Are we really differentiating instruction in the most effective ways?' Effective teachers have multiple ways of engaging learners. Innovation in education signals that you are moving forward with meaningful goals. You are not just moving from fad to fad.
>
> Teachers are leaders but they are not always given the time, resources, and tools needed to lead. We also need teachers who embrace cultural difference.
>
> Technology can enhance our students' literacy skills if it is wisely integrated. Students can collaborate on line. There are many excellent programs where students can learn in self-directed ways from an on-line course. Time, space, and the concept of school, education, and learning will continue to evolve. We need to focus on multiple forms of literacy. Mixing art, screen writing, literature, and inquiry that links English, history, and the sciences will result in greater creativity. I see myself as a "challenger" and "disruptor" of the status quo. I also identify most closely with the roles of a collaborator, co-inquire, and researcher. Our students need multiple skill sets if they are going to be successful technicians, teachers, lawyers, medical practitioners, and so on. (Magro, 2011, interview transcript notes).

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In interviewing the teachers collecting various artifacts of their teaching, I was able to discovery the teachers' standpoints on the social world. Providing teachers with more opportunities to share their perspectives on learning is one way for them to "multiply the perspectives through which they look upon the realities of teaching; they may be able to choose themselves anew in the light of an expanded interest, an enriched sense of reality" (Greene, 1995, p. 33).

Given the current context of increasing globalization and multi-culturalism that flourishes in many of our cities world wide, teachers today need to develop innovative curricula and learning strategies that address issues of diversity, ethics, and equity. How can social justice and transformative learning be advanced in our schools? In his research with African-Canadian youth in Toronto who leave high school early, Dei (2012) points out that too many youth from minority and Indigenous backgrounds become alienated and disengaged with traditional forms of education that exclude their cultural backgrounds and collective histories. Dei emphasizes that education needs to place the learner [their histories, experiences, cultures, and knowledge] at the centre. He further notes that "the role of teachers cannot be underestimated and that there is something fundamentally and morally wrong for students to go through the system and not be taught by educators who also share their cultural, racial, sexual, and gender backgrounds" (pp. 119-120). A "pedagogy of language liberation" (Dei, 2010) would empower learners to tell their stories and learn about their heritage, history, and culture in interconnected ways. For Dei, spirituality "is about a material and metaphysical existence that speaks to an interconnection of self, community, body, mind, and soul" (p.120).

Transformative teaching and learning from a non-Western perspective enables educators to extend their teaching practices and perspectives with creativity and a sense of cultural inclusion. This holistic "multi-centre" and holistic/spiritual perspective of transformative learning theory examines the relevance of race, class, gender, and [dis]ability identity in relation to education ( Alfred, 2008; Dei, 2010; Ntseane, 2007). The common characteristics of indigenous knowledge include: "Seeing the individual as part of nature; respecting and reviving the wisdom of elders; giving consideration to the living, the dead, and future generations; sharing responsibility, wealth, and resources within the community; and embracing spiritual values, traditions, and practices reflecting connections to a higher order, to the culture, and to the earth" form this holistic knowledge base. (Merriam and Kim, 2010, p. 380). George Sefa-Dei (2010) explains that a school system that fails "to tap into youth myriad identities….is short changing learning. Identity is an important site of knowing. Identity has in effect become a lens of reading one's world…the role and importance of diversity in knowledge production is to challenge and subvert the dominance of particular ways of knowing" (p. 119-120).

Drawing on her own research on African indigenous knowledge, Ntseane (2007) explains that years of colonial rule and an adherence to technical rationality and western educational values worked to erode the values of African culture from one generation to the next. She writes: "As a result of education systems that neglect the African philosophy of life, it can be argued that one of the major conflicts in Africa and globally has been a lack of understanding, appreciation, and tolerance of other cultures and ways of life of people" (p.115). African education traditions, she explains, value practical knowledge, the preservation of cultural heritage, a participatory education for the common good, storytelling, and the interpretation of dreams, visions, and proverbs. An Afro-centric approach highlights a spiritual, narrative, and multi-centre cultural perspective that validates collaborative learning, collective histories, and the value of oral traditions. Practical knowledge enables individuals to solve everyday problems in creative and useful ways.

Johnson-Bailey and Alfred (2006) developed a framework for transformative teaching that is rooted in teacher self-awareness, social justice, consciousness raising, and developing a safe classroom

climate that encourages "connected ways of knowing" (Johnson-Bailey & Alfred, p.57).

> Each class we teach has varied instructional modes (printed materials, audio, WebCT components, video presentations guest lecturer, collaborative and individual projects) and a range of other ways in which students can participate…Perhaps the most often used and most successful building block of our transformational teaching is the use of dialogue, an informal conversational approach for verbal exchanges and discourse — a more formal, linear, and directive methodology. It has been our experience that multiple voices, whether ordered as discourse or free flowing dialogue, produce a symphony of ideas and lay groundwork that supports an environment where change is possible." (Johnson-Bailey & Alfred, p. 47)

Emancipatory teaching and empowerment may be in the form of helping students develop greater self-confidence or helping them gain the academic and social skills needed to succeed in college and in a career. Learning is lifelong. Innovative and transformative ideas in education can result in more enriching and creative learning opportunities for children, youth, and adults. *The Deeper Learning Network* is an organization of more than five hundred K-12 schools in the United States that in essence, provide a framework for encouraging transformative learning. Similar to many of the ideas highlighted in this paper, the network advocates an interdisciplinary and experiential approach to education that embraces critical thinking, collaboration, communication, and creativity (Wagner and Dintersmith, 2015; Wagner, 2008). In their approach (DLN), students have opportunities to master core academic content while practicing ways to discover, evaluate, and synthesize information to solve complex problems. Collaborative and self-directed learning strategies further provide students with opportunities to write and present speeches on powerful topics that they have chosen. Self-efficacy, the cultivation of emotional intelligence, authentic learning experiences that help learners make cross curricular connections between their course work, the real world, and future success all contribute to the development of an "academic mindset" (Wagner and Dintersmith, 2015, p. 248).

## Conclusion thoughts

Hamilton (2007) suggests that transformative learning theory can have practical applications for theorists and practitioners across the disciplines. A critically reflective stance can improve self-awareness and active inquiry. Enhanced efficiency, a better appreciation of the role of inquiry and questioning into the teaching process, an openness to learning from other disciplines, and increased collaboration between teachers and learners resulting in the co-creation of enriched learning experiences are among the outcomes of a transformative approach to academic leadership. In studying the themes, patterns, and issues that cut across the disciplines, opportunities for "deepening, broadening, and enriching debate and dialogue about the notion of scholarship in teaching and learning itself" can emerge. "The scholarship of teaching and learning is viewed not only as means of personal change but as an avenue for promoting disciplinary or systems-level change" (p.3).

Innovation in teaching can result in creative learning (Meier, 2002; Tough, 2013). For transformative learning to occur within a context of social justice, the teacher must take risks to challenge the status quo in education; in working with students, teachers could strive for a balance between support and challenge. Choice, personal empowerment, and helping learners "build bridges" from prior knowledge to new knowledge requires teachers who are visionary and creative. Education should offer promise, hope, and possibility; however, to ensure this, a

vision that embraces complexity, tension, equity, and diversity must be re-imagined. The psychological, situational, and institutional barriers that prevent under-represented individuals from taking part in the "knowledge economy" must be creatively solved together. As educators, we play a vital role in this dynamic process. Learning is an expansion of ideas that ultimately can engage individuals in improving important social, political, and cultural issues of our time. It is a journey that involves a personal quest, as Hill (2008) notes, for "truth, authenticity, and what is right" (p.89).

Uniquely, the articles that comprise this special IJTDC issue explore this fascinating journey.

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**Target Paper:**

# Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundations for Gifted Education

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## Abstract

Arguments over conceptions of giftedness and provisions for the gifted bear similarities to arguments over key constructs in other disciplines. We can clarify and strengthen the conceptual foundations for gifted education by going beyond psychology and education to explore theory and research in other disciplines such as cultural anthropology, ethical philosophy, history, sociology, economics, and the philosophy of science. Based on long-term experiences with interdisciplinary inquiry, including collaborative, interdisciplinary projects involving leading thinkers from multiple fields, this focus article provides suggestions about ways in which scholars can shed new light on high ability. The suggestions include frameworks for individual and collaborative interdisciplinary exploration and discussion of the benefits and pitfalls of such work. The analysis provides the basis for reactions from leading thinkers in the fields of gifted education and creative studies. Respondents will react to the recommendations for further interdisciplinary work, especially in the field of gifted education, looking for strengths, flaws, and refinements.

**Keywords:** Interdisciplinary; transdisciplinary; theory; research; gifted; education; creativity; dogmatism; metaphor.

Should the field of gifted education reach beyond its own borders to engage in more interdisciplinary work? Might we generate stronger understanding of some phenomena pertaining to high ability if we borrow and use more theoretical and research-based insights from disciplines in the social sciences, humanities, and natural sciences? What benefits and drawbacks might emerge from more interdisciplinary scholarship in the field?

There is a strong trend toward interdisciplinary collaboration and idea-borrowing throughout academia and the professions, and the trend is stronger in some disciplines than in others (see Ambrose, 1998, 2009a, 2012a; Frodeman, Klein, Mitcham, & Holbrook, 2010; Madni, 2007; Rice, 2013; Suresh, 2013). In this article I explore some of the reasons for interdisciplinary work in various fields and suggest how the field of gifted education might enhance its productivity by crossing its borders more frequently and navigating into the conceptual terrain of various disciplines. I begin by clarifying the nature of interdisciplinary scholarship and providing some examples of interdisciplinary work that is being done outside our field. After that, I develop some rationale for the expansion and invigoration of interdisciplinary work in gifted education. Part of this rationale includes descriptions of some interdisciplinary projects that have emerged in gifted education followed by some recommendations to guide further interdisciplinary excursions and collaborations.

Because this is a focus article for a special issue, I conclude many of the subsections to come with questions that I hope will invite respondents to think about the promise and pitfalls of interdisciplinary work in gifted education. In some cases I cite a few examples of current research and theory within and beyond the field that partially answer some of these questions but I don't address all possible examples because that would require several book-length publications. Instead, I invite respondents and readers to provide additional answers and examples of ways in which gifted education already is doing some interdisciplinary work pertinent to the phenomena of interest or to suggest some additional opportunities for this kind of work.

## What is interdisciplinary scholarship?

Before discussing the value of interdisciplinary work in gifted education, it is important to clarify some terminology. For several decades there has been ambiguity about the nature of interdisciplinary inquiry. Recently, definitions have begun to distill. For example, in a helpful clarification of the nature and purposes of interdisciplinary scientific research, Wagner et al. (2011) distinguished three different forms of border-crossing academic work--multidisciplinary, interdisciplinary, and transdisciplinary inquiry. Others developed similar differentiations (see Begg & Vaughan, 2011; Garvin, 2012; Klein, 2010; Misra, Hall, Feng, Stipelman, & Stokols, 2011; Stock & Burton, 2011). Essentially, the degree of conceptual integration increases as an individual or a team made up of researchers from different disciplines moves from one end to the other of a continuum with multidisciplinary work fitting at the least integrative end, transdisciplinary work fitting at the most integrative end, and interdisciplinary work in the middle.

These distinctions can be helpful when considering examples of, and possibilities for, interdisciplinary work in gifted education; however, in spite of these differences in terminology, the term “interdisciplinary” dominates the literature on academic and professional border crossing, so I use that term in most places throughout the rest of this article. Exceptions occur when phenomena, issues, or projects are obviously of transdisciplinary nature. Note that considerations of interdisciplinarity enable us to contemplate discussions in the field of gifted education pertaining to professional knowledge bases, theoretical constructs, investigative methodologies, interdisciplinary teamwork, and publishing projects.

## Examples of interdisciplinarity in complex disciplines

This section includes some examples of interdisciplinary work done beyond the borders of gifted education. These are provided to suggest some ways in which scholars in gifted education might engage in similar work. Of course, it would be impossible to include a comprehensive list of such examples because they are far too numerous for treatment in a single article. A much larger but obviously still incomplete list of examples can be found in Ambrose (2009a). For this article, I have selected examples that I think are particularly relevant to our field and raise questions about that relevance after each of the following illustrations.

### Intricate patterns in complex adaptive systems

The vibrant and growing interdisciplinary work in complexity theory entails the study of the structure and dynamics of complex adaptive systems. Complexity science is very broad because complex adaptive systems are ubiquitous. Examples include a human brain-mind system, networked groups of human minds, traffic patterns in major cities, animal

populations in ecosystems, national and global socioeconomic systems, and more (see Anteneodo & da Luz, 2010; Lineweaver, Davies, & Ruse, 2013; Miller & Page, 2007; Page, 2010).

The nature and implications of patterns in complex adaptive systems are too numerous for detailed treatment here so a brief overview of one pattern will have to suffice. Complex systems tend to oscillate along a behavioural continuum from excessive order to excessive chaos with a dynamic, complexity generating space in between known as the *edge of chaos.* When the system locks into either excessive order or excessive chaos, its behaviour lacks productive complexity. When the system finds the fine balance between chaos and order at the edge of chaos its behaviour becomes intricate and highly productive and creative when human minds are involved.

Borrowing this pattern and other insights from complexity theory can enrich gifted education by moving us beyond excessively sanitized and oversimplified, highly mechanistic notions of human potential and behaviour, and by revealing some promising ways to structure learning environments (see Ambrose, Sriraman, & Pierce, 2014; Dai & Renzulli, 2008). For example, it is possible that many phenomena in gifted education can map onto the chaos-order continuum and the mapping can help us understand how to nudge our complex, adaptive systems into the productive zone of complexity where chaos and order find exquisite balance at the edge of chaos. What dimensions of curriculum, instruction, counselling, research methodology, and theory development are amenable to analysis through the lens of the chaos-order continuum?

**The evolution of conflicts in cognitive science**

Another vibrant, interdisciplinary field with relevance to gifted education is cognitive science. This field brings together and often attempts to integrate the work of psychologists, neuroscientists, computer scientists, philosophers, and others in attempts to make sense of the most complex organic system ever studied: the human brain-mind (see Clark, 2001; Rose, 1998; Thagard, 2012; Thompson, 2007). Given its complexity and diversity, cognitive science makes room for various inquiry methods from philosophical thought experiments and theoretical syntheses, to case studies, to computer-based simulations of thought processes, to experimental studies of human behaviour.

As with most complex fields, cognitive science often includes conflicts. For example, years ago two eminent cognitive scientists engaged in a high-profile argument over a metaphor. After pioneering cognitive scientist Marvin Minsky made the statement that the human brain is a "meat machine," Joseph Weizenbaum (1995), another leading cognitive scientist, argued that the metaphor was misleading and demeaning because meat can be burned, eaten, and thrown away. He said Minsky's meat machine metaphor involved "a very deliberate choice of words that clearly testifies to a kind of disdain of the human being" (p. 259).

Looking into the field of cognitive science can inform gifted education by providing us with an example of a prominent, influential, mind-related body of work that is primarily interdisciplinary in nature. As such, it can encourage us to become more interdisciplinary in our attempts to understand high ability. Also, the example of the battle over metaphor between two leading minds during a vibrant growth phase in this complex field suggests that such battles may arise in our field as well, especially because metaphor often operates below our level of awareness (see Ambrose, 1996, 1998b, 2012a, 2014; Lakoff & Johnson, 1980,

1999). Can we, and should we, emulate the tendency of cognitive scientists to engage in far-flung interdisciplinary collaborations? What battles over metaphor are emerging in gifted education, or might emerge given current trends in research and theory?

These examples of constructs and initiatives from other fields provide some food for thought about the potential of interdisciplinary work in a general sense. But before pursuing any major interdisciplinary initiatives in gifted education, it is important to provide more clarification about the reasons for doing so.

**Why is more interdisciplinary scholarship necessary for progress in the field of gifted education?**

The complexities of high-potential and high-performing human minds require insights from multiple disciplines. Deriving insights from research and theory in psychology and education is necessary but insufficient for establishing adequate conceptual frameworks for gifted education. Constructs from other disciplines can reveal important, hidden dimensions of high ability, new questions for inquiry, and some possible misconceptions that can generate and reinforce dogmatism in our field.

More specifically, engaging in interdisciplinary exploration can enable our field to appreciate the immense complexity of the phenomena we study; avoid excessive envy of the precision of the natural sciences; simultaneously value diverse inquiry tools including various forms of empiricism, theory development, and philosophical analysis; escape dogmatic thought patterns and hypnotic focus on favoured theories; understand phenomena ranging from the micro-levels of biological systems to the macro-levels of socioeconomic and ideological contexts; and generate cognitive diversity while embracing 21st-century scientific networking.

**Recognizing the complexity of the problems we face**

Interdisciplinary work emerges in academia and the professions because complex phenomena and problems often extend beyond the borders of a single discipline and require attempts to integrate diverse concepts to the extent possible (Ambrose, 2005b, 2009a, 2012a; Boix Mansilla, 2006; Gardner, 2006; Klein, 1990, 2010; Nicolescu, 2002). Disciplines and fields that encompass very broad, difficult-to-define phenomena can find interdisciplinary work particularly necessary because precise, domain-specific discoveries and problem solutions are more elusive in their conceptual terrain than they are in fields encompassing more precise, isolatable, mechanistic phenomena. For example, Daily and Ehrlich (1999) argued that sharp distinctions between disciplines seemed to work in earlier times. However,

> Few significant human problems lie within the boundaries of current disciplines. A question such as 'What is consciousness and how does it relate to emotions?' might be considered primarily in the arenas of neurobiology and philosophy, but important dimensions clearly also lie in fields such as genetics, endocrinology, evolution, and behavior (p. 277).

They went on to argue that failure to recognize the interdisciplinary breadth of complex phenomena can lead to naïve answers and counterproductive policies.

Metaphorically speaking, we can think of interesting phenomena as scattered over a vast, conceptual landscape. Over the course of time, academic disciplines claimed territory, staked out borders, and built epistemological and even ontological domain-protecting fences on that terrain where the phenomena that interested them reside. While some phenomena may stay localized within the borders of a single discipline, that's becoming less the case,

especially with complex issues and problems. Avoiding border crossing on this terrain makes it likely that we will arbitrarily and unwittingly section off and ignore large portions of the phenomena we scrutinize because those portions are not on our side of the fence. This will distort our understanding of those phenomena.

In our field, Hong (1999) recommended more attention to interdisciplinary research that might expand and clarify our notions of cognition and expertise among the gifted. Such expansion and clarification is particularly important when it comes to constructs that resist simplification. For example, prominent scholars of intelligence and giftedness have recommended more attention to interdisciplinary work in the development of theory about the nature and nuances of intelligence, an especially complex, contentious topic that is at the core of gifted studies (see Kaufman, Kaufman, & Plucker, 2013).

What phenomena of interest in gifted education might lose meaning and become distorted if we refuse to travel across our border fences into the disciplines that harbour some of their elements? Can finding interesting patterns in far-flung disciplines enable us to appreciate and grapple with more of the complexity that surrounds and permeates our field? Can promising, innovative interdisciplinary and even transdisciplinary work in other fields suggest ways for gifted education to generate similar initiatives?

**Flight from reality, sterile certainty, scientific illusion, discipline envy, and nuanced STEAM on the hierarchy of the sciences**

Shapiro (2005), a leading political scientist, identified some serious problems with scholarly work in the social sciences and humanities, especially in the law and economics paradigm and the rational choice model that guides it. He showed that many researchers in these fields detach themselves somewhat from the phenomena they are studying and focus more on the intricacies of their methodological tools and favoured theories. The results include excessive reductionism in analyses of human behaviour and overzealous statistical modelling. Putting these problems together, Shapiro termed these tendencies the "flight from reality in the human sciences." His antidotes to the dogmatic flight from reality included paying more attention to the ways in which phenomena and problems of interest are identified. This might be construed as more attention to problem finding as opposed to jumping ahead prematurely to problem solving, if we borrow from the creative-problem-solving process in our field (see Treffinger, Isaksen, & Stead-Dorval, 2006).

Related to the flight from reality, Simonton's (2004, 2009, 2012) hierarchy of the sciences, which entails intriguing analyses of the ways in which scholars think and work within their disciplines, places the natural, physical sciences at the top, the biological and behavioural sciences in the middle, and the social sciences at the bottom. Work in the higher disciplines is characterized by more mechanistic precision and predictability while work in the lower disciplines tends to entail more ambiguity, imprecision, and uncertainty.

Based on somewhat mistaken notions that the natural sciences are superior to the social sciences and the humanities because natural science generates more precise findings based on objective, quantitative-empirical research methods, less precise fields strive to emulate the conceptual frameworks and inquiry methods of the natural sciences (see Ambrose, 1998a; Arecchi, 1996; Cross, 2003; Midgley, 1998; Nicolescu, 2002; Schwartz, 1992). That is fine to some extent as long as it doesn't become an obsessive pursuit of mechanistic empiricism while marginalizing all other forms of scholarship.

Evidence for this envy-driven copying of the natural sciences can be seen in various disciplines. Such mimicking happened in psychology in the mid-20th century when that field dogmatically followed behaviourist theory for a sustained period of time (Ambrose, 2009a; Cross, 2003; Gardner, 2008). Psychology craves recognition as a science. Behaviourism was an attempt to sanitize the investigative methodology of the discipline to make its findings more objective and precise. The paradigm generated some productive insights for psychology but it exerted so much influence on the field that rich insights about the social-emotional and subconscious aspects of mind were ignored in favour of a sanitized black-box vision of cognition and excessive attention to carrot-and-stick manipulation of human actions.

Economics also attempts to copy the precision of the natural sciences. The dominant conceptual model in the field, the rational actor, is a distorted, sterile version of the human economic decision maker (Ambrose, 2012b; Marglin, 2008; Piketty, 2014; Quiggin, 2010; Sen, 2010; Stiglitz, 2003, 2010). Along with excessive attention to hyper-mechanistic inquiry methods, this model makes research in the field more focused, precise, and "scientific" than it otherwise would be but it causes significant problems as well. While presenting the results of his highly influential critique of failures in the global economy, Piketty (2014) elaborated on this form of dogmatism:

> I dislike the expression 'economic science,' which strikes me as terribly arrogant because it suggests that economics has attained a higher scientific status than the other social sciences. . . . For far too long economists have sought to define themselves in terms of their supposedly scientific methods. In fact, those methods rely on an immoderate use of mathematical models, which are frequently no more than an excuse for occupying the terrain and masking the vacuity of the content. (p. 573-575)

He went on to call this dogmatic tendency a *scientific illusion* and argued that economic scholarship should expand its scope to include political, social, and cultural influences. In essence, he was calling for more interdisciplinary connection-making in his field to break out of its current form of dogmatic, sanitized myopia. More detail about economic dogmatism appears in a later subsection of this article.

Looking into yet another discipline, arguably, the precision and high status of mathematics would place it very high on the hierarchy of the sciences. But as noted in the prior examples, things in academia are not always as they appear. William Byers (2007, 2011) is a prominent mathematician who has studied the structure and dynamics of his discipline and the natural sciences in depth and detail. He concluded that inquiry in mathematics and the natural sciences is much less certain, precise, and bound to logic than most believe, including many who spend their lives doing mathematical and scientific work. Instead, those who assume they will achieve exceptional mechanistic precision in these high-level disciplines fall prey to a form of dogmatism in which their minds are captured by sterile certainty, the imposition of somewhat artificial, unwarranted conceptual order on the constructs they are studying. This occurs because the deep-level nature of these disciplines actually includes considerable imprecision and uncertainty. For these reasons, mathematics and the natural sciences require investigators to embrace ambiguity, paradox, and aesthetics. This likely is at least part of the reason why Simonton (2009, 2012) reported that the creative, transformative, eminent investigators in the lofty disciplines of the scientific hierarchy operate somewhat more like investigators in the fuzzier disciplines in the lower regions of the hierarchy instead of functioning like the more pedestrian, certainty craving members of their own high-status disciplines. Those most creative in the "higher-level" disciplines tend to be more intuitive, subjective, and emotive than their logical, objective, and formal, but less-creative peers.

Consistent with these discoveries, there also has been some effort to highlight the need for integration of the arts with the STEM disciplines in gifted education. In the frenzy to stay apace in international competition based on assumptions that STEM achievements are the key to future national prosperity, the importance of the arts tends to be marginalized. Some have been working to address this problem by changing STEM to STEAM (with the addition of the arts) in education. For example, Sriraman and Dahl (2009) wisely recommended more attention to curriculum integration for the purposes of encouraging more expansive polymathic development integrating mathematical, scientific, and artistic learning. Such approaches could help inoculate gifted young people against the sterile certainty and the flight from reality they will be exposed to when they become adult mathematicians or scientists. The work of Robert and Michele Root-Bernstein also is very important to the recognition that STEM must become STEAM within and beyond gifted education (Root-Bernstein, 2003, 2009; Root-Bernstein et al., 2008; Root-Bernstein & Root-Bernstein, 2013).

To what extent are we engaged in a flight from reality in gifted education? Are we locked into particular paradigms that are resistant to analyses of socioeconomic, political-ideological, and cultural influences on high ability? Do we ignore the complexity and opportunities that can be revealed through analyses of investigative methodologies and theories in other disciplines? Can we learn from mistakes made in the theoretical and empirical-methodological work of other disciplines?

Is gifted education also prone to discipline envy? Does our field excessively strive to emulate the natural sciences and, if so, does that emulation lead to conceptual distortions or marginalization of findings that align with the "soft" disciplines, that include the humanities and the less mechanistic social sciences (for some helpful exploration along these lines see Coleman, Sanders, & Cross, 1997; Cross, 2003). Arguably, psychology falls prey to the same scientific illusion that plagues economics because psychologists also are fond of calling their discipline a science. To the extent we align ourselves excessively with psychology, are we catching the illness of hyper-mechanistic sterile certainty from that field?

To what extent are theorists, researchers, and practitioners in gifted education prone to misconceptions about the mechanistic certainty they think they will find in mathematics and the natural sciences? If they are prone to these misconceptions, which are common among researchers and theorists in mathematics and the natural sciences, are professionals in gifted education selecting highly proficient but somewhat pedestrian thinkers for gifted programs while ignoring young potential Einsteins who are willing and able to embrace more ambiguity, paradox, and aesthetic wonder in mathematical and scientific work?

**Acknowledging the importance of the empirical holes we are drilling without falling into them**

Another issue is closely related to the problems of discipline envy and sterile certainty discussed in the prior subsection. It is helpful for academics to back away periodically from the detailed findings we lift out of the empirical holes we drill into the conceptual terrain of the field to look at big-picture patterns. Not doing so can hinder progress. While empirical research is the lifeblood of most academic disciplines and professional fields, including the field of gifted education, it should be augmented with insightful conceptual guidance. Laurence Coleman (2003), a leading theorist in the field, lamented the atheoretical nature of research in gifted education, saying that insufficient attention to the theoretical dimensions of the field was slowing the progress of inquiry.

In addition to being excessively atheoretical, the field also may be ignoring some important philosophical thought. Understandably, gifted education is concerned mostly with curriculum, instruction, and counselling at the practical ground level, which is the base level of four analytic levels identified in a macro-analysis carried out by Ambrose, VanTassel-Baska, Coleman, and Cross (2010). The other three levels are research, theory, and philosophy. At the practical level, fine-grained curriculum planning, differentiation, and other aspects of school-based work become visible. As one moves up through the other three levels, the school-based detail fades while broader issues come into view, issues such as research methodology and theoretical and philosophical frameworks. But these broader issues often are less than clear and disconnected from practicality, especially at the philosophical level: "The level of philosophy is disconnected from the other levels because so few professionals attend to it. We are atheoretical but we may be even more aphilosophical" (Ambrose, VanTassel-Baska, Coleman, & Cross, 2010, pp. 472-473).

When a field often suffers from atheoretical and aphilosophical inquiry, it can lack sufficient conceptual guidance and end up engaging in incremental wandering down increasingly barren inquiry paths. But is there additional justification for non-empirical work in the field? Again, looking into other fields provides helpful examples. One is the broad, expansive, important work done by social epidemiologists Wilkinson and Pickett (2009) who developed international comparisons of the ways in which socioeconomic inequality aggravates social problems:

> A difficulty in proving causality is that we cannot experimentally reduce the inequalities in half our sample of countries and not in the others and then wait to see what happens. But purely observational research [as opposed to experimental research] can still produce powerful science--as astronomy shows. (p. 193)

In addition to this kind of non-experimental, broad observational work, philosophical inquiry is based on conceptual syntheses and analyses and virtually all of it is non-empirical because some important questions require intricate, conceptual work and resist empiricism (Marks, 2001). Questions in gifted education that are conducive to philosophical analysis might have to do with the ethical dimensions of high ability and the influence of ideological contexts on student development. Analyses of the influence of metaphorical world views also require macro-philosophical thinking.

**Learning from dogmatic patterns in the structure and dynamics of other disciplines**

Lack of insightful, conceptual guidance also can occur when a field locks itself into dogmatic adherence to a particular theoretical perspective, as did behaviourist psychology. Interdisciplinary exploration can enable a field to learn from the mistakes of other disciplines when it comes to atheoretical or dogmatic-theoretical incremental wandering. Two additional examples of productive interdisciplinary insights are relevant here. One comes again from the highly influential field of economics and the other comes from cultural anthropology.

While there has been some recent, minor restructuring, for decades economics has been a unified, insular, firmly policed discipline as opposed to a fragmented, porous, contested one (Kreps, 1997). It was unified around a dominant theory; that of the model of the rational actor, described earlier in this article as a sanitized view of the individual who makes rational decisions based on perfect information sets for self-serving reasons. It was insular because it resisted the invasion of ideas from foreign paradigms or disciplines. It was firmly policed because the gatekeepers of the profession rejected academic articles that did not fit the orthodoxy. In contrast, fragmented, porous, contested disciplines such as political

science and English studies tend to have battles over theories, none of which is dominant, and they either cannot or will not resist invasion by foreign ideas (for elaboration see Bender & Schorske, 1997). There can be powerful, even devastating consequences when a field becomes theoretically dogmatic. For example, the insular dogmatism of the rational actor model in neoclassical economics encouraged the financial industry to engage in questionable practices that precipitated the 2008 economic collapse and severely damaged the world economy (see Ambrose, 2012b; Piketty, 2014; Sen, 2010; Stiglitz, 2010).

Analyses have shown that gifted education and our sister field, creative studies, both fit the fragmented, porous, contested pattern (see Ambrose, 2006; Ambrose, VanTassel-Baska, Coleman, & Cross, 2010). Dogmatism can prevail in fields that fit either pattern. Dogmatism is centralized in the form of a dictatorial conceptual framework in the unified, insular, firmly policed disciplines, and decentralized into skirmishing camps in the fragmented, porous, contested disciplines. What are the implications for gifted education? Can we become more unified without falling prey to a distorted, artificially sanitized model of the human actor, as in the economic rational actor?

## Centrifugal inquiry *versus* crystallized definitions

Another interdisciplinary theoretical insight, which comes from cultural anthropology, has to do with angst over conceptual fragmentation. Years ago, major thinkers in cultural anthropology lamented some confusion coming from important concepts in their discipline. For this reason, they came together with the intent of generating an agreed-upon theory of the central concept in their discipline: culture. Unfortunately, the best they could do was to boil down the concept into 171 definitions that could be sorted into 13 categories (Geertz, 2000). The central concept of their discipline simply was too multifaceted for distillation into a singular construct.

Can we embrace the cognitive diversity of our field as have some leading cultural anthropologists such as Clifford Geertz (2000) who said his discipline benefited from its lack of conceptual centralization? According to Geertz (2000), "one of the advantages of anthropology as a scholarly enterprise is that no one, including its practitioners, quite knows exactly what it is" (p. 89). He argued that excessively distilled definitions do more harm than good and do not reflect the realities of human experience. More generally, he claimed that the centrifugal impulse of cultural anthropology, generated by an ever-increasing collection of findings about diverse cultures around the world, ultimately was advantageous to progress in the field.

Arguably, manifestations of giftedness are influenced substantially by culture so should gifted education align with Geertz's (2000) thinking in this regard and embrace a centrifugal impulse to some extent, or should it strive for strong, centralized distillation of its concepts, as did the field of neoclassical economics. Or, is there a middle ground? Does anyone in the field of gifted education know exactly what giftedness is? Do we have a centrifugal impulse in our field that spins us ever outward? If yes, can we cope with the ambiguity this entails? If we can cope, will interdisciplinary work provide some of the useful centrifugal force? If interdisciplinary work does provide some centrifugal impulse for the field, will the ensuing discoveries in far-flung conceptual terrain ultimately and paradoxically lead toward some theoretical distillation and clarity?

Over the years, prominent thinkers in gifted education have attempted to clarify important concepts in the field, including the central concept in our discipline — giftedness

(see Plucker & Callahan, 2012; Sternberg & Davidson, 1986, 2005). Of particular note, Subotnik, Olszewski-Kubilius, and Worrell (2011) encouraged the field to embrace the notion of eminence in a domain as a guiding framework for inquiry. This work included some interdisciplinary connection making. It also stirred up some arguments in the field (see Plucker & Callahan, 2012).

Are we forever doomed to dealing with multiple interpretations of important, key constructs? Can we develop consensus over a single definition of the central concept in our field without falling prey to oversimplification as did the economists with their rational actor model? Or, must we be satisfied with fragmented concepts like the multidimensional concept of culture with which cultural anthropologists had to grapple?

## Expand our vision to take in more levels of analysis

Another, possibly more compelling reason for gifted education to travel in the terrain of multiple disciplines is that phenomena relevant to our field can be found at multiple levels of analysis from the broad-contextual down to the molecular-atomic (Ambrose, 2005b). For example, much of our research and theory operates at the level of the individual addressing the cognitive, motivational, affective, dispositional, and achievement dynamics of the gifted child. Other research and theory moves outward to the immediate contextual level of analysis dealing with curriculum, instruction, and the organizational constraints of schools and classrooms.

These two levels account for most of the scholarship in our field; however, other phenomena are relevant to giftedness. We can extend outward to the broad contextual level of analysis, which enables us to perceive insights from sociology, political science, economics, and related disciplines. These disciplines can reveal the influences of power, domination, subordination, and enterprise opportunities that put contextual pressures on the aspirations and talent development of the gifted. We also can telescope down to much smaller levels of analysis within the individual child. For example, the level of organic systems makes visible the structures and functions of brain subsystems that are revealed by neuroscience. At the even smaller cellular level we can see the structures and functions of neurons and neural networks in the brain. And at the very small molecular-atomic level, we might gain insights about genetic influences on behaviour based on research in molecular biology. Awareness of these levels of analysis is strong justification for more interdisciplinary work in gifted education.

To some extent, some in gifted education have explored the macro- and micro-levels of analysis. For example, Jennifer Cross and Jim Borland (2013) recently led a special issue of the *Roeper Review* into the macro-level where the ideas of economists, sociologists, political scientists, and social epidemiologists reside. Their special issue explored the impact of socioeconomic inequality on the gifted and talented. In contrast, Layne Kalbfleisch (2008) led another special issue project into the micro-levels where neuroscientists explore neural networks and the structure and function of brain regions. What other expeditions might researchers and theorists in our field take into the macro- and micro-levels of analysis?

## Capitalize on the power of cognitive diversity and networked science

According to Subra Suresh (2013), former director of the National Science Foundation and chair of the Global Research Council, natural scientists are emerging from their isolation within localized, disciplinary silos to work together on difficult problems. He pointed out that international, interdisciplinary scientific collaboration is becoming the new

norm in scientific work because investigators are beginning to recognize that the combination of diverse ideas and viewpoints accelerates scientific innovation. Similarly, Nielsen (2011) described the integrative, synthesizing power of unpredictably emergent online collaborative projects dealing with extremely complex problems that have been resistant to solution by highly intelligent individuals or isolated groups in mathematics, the natural sciences, and some professions. He showed how the combination of "modularized microexpertise" from many individuals, each of whom possesses one or a few small pieces of an intellectual puzzle, tends to go beyond the problem-solving abilities of even the most eminent thinkers in a domain. Specific examples of this innovative, collaborative problem solving included the polymath project for tackling previously impenetrable mathematics problems, an open architecture design project, the Galaxy Zoo astronomy project, and a game-based process for the invention of new proteins for combating disease. Others also highlight the value of networking diverse minds (see Begg & Vaughan, 2011; Frodeman, Klein, Mitcham, & Holbrook, 2010; Klein, 1990; Madni, 2007; Rice, 2013; Stock & Burton, 2011; Wagner et al., 2011).

Some additional scholarship aligns well with these trends. Economist and complexity theorist Scott Page (2007, 2010) synthesized large bodies of research on group problem solving in various organizations, finding that cognitively diverse teams tend to outperform homogenous teams, even when the latter possess more intelligence than the former. Cognitively diverse teams encompass diverse problem-solving heuristics, and/or theoretical perspectives, and/or belief systems.

Figure 1 portrays what might occur in an academic field such as gifted education when it capitalizes on interdisciplinary, international scientific networking, and the cognitive diversity such networking can generate. The visual metaphor in the figure portrays the field as a research problem-solving landscape with the vertical dimension representing the relative success of problem-solving efforts. The two arrows and a collection of coalescing dots on the surface of the landscape represent three different kinds of problem-solving initiatives. The dotted arrow signifies the investigative work of an insular, dogmatic individual or small group. The narrow, superficial, shortsighted vision of the problem solver(s) in this scenario leads the initiative to tumble into a dogmatic sinkhole, which represents the inaccuracy and failure of the investigative project. The solid arrow represents an insular but highly creative and intelligent individual or small group traversing the landscape while engaging in inquiry. The impressive cognitive capacities involved in this initiative lead toward success on the top of a solution mesa but the elevation is limited so the problem solution is mediocre in comparison with what can be achieved with yet another method.

Finally, the large number of dots covering the landscape represents a diverse, interdisciplinary, international group of individuals coming together and coalescing around a problem in the field. Each individual possesses one or more pieces of the modularized microexpertise described by Nielsen (2011) and their coalescing represents the unpredictably emergent, online collaboration that combines and synthesizes their diverse elements of knowledge or skill. Some of these individuals import theories, research findings, or methodological tools from foreign disciplines so the synthesized inquiry outcome is likely to include rich cognitive diversity as described by Page (2007, 2010). The result can be ascendance to the lofty elevation of an optimal solution pinnacle representing impressive success high above the metaphorical landscape. As per Nielsen's (2011) findings and Suresh's (2013) observations, the era of the lone genius and silo-bound insularity is ending so the pinnacle is inaccessible to the individual genius or to a much smaller, less diverse group,

no matter how brilliant that group might be.

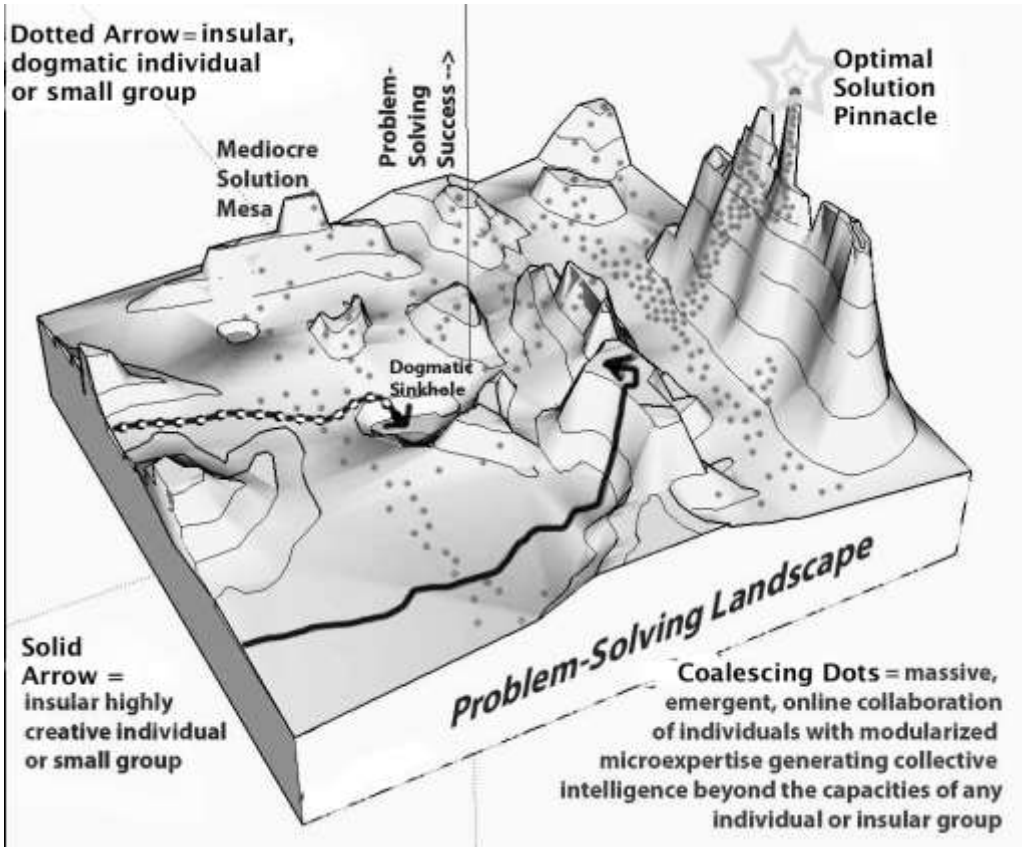


**Figure 1:** Visual-metaphorical portrayal of progress in an academic discipline deriving from the creative, integrative power of interdisciplinary, networked science and cognitive diversity.

If gifted education aspires to be more scientific, as do most disciplines and professions that are not situated in the lofty, natural-science region on Simonton's (2004, 2009, 2012) hierarchy of the sciences, might it be better if those aspirations align with new, emerging, interdisciplinary-international trends in the natural sciences than with the more insular, silo-bound mid-20th century version of scientific work? To what extent is gifted education able to establish interdisciplinary, international collaborations around important issues and phenomena? To what extent do cognitively diverse teams of experts in our field come together to share diverse problem-solving heuristics (i.e., research methodologies), theoretical perspectives, and belief systems (i.e., philosophical and cultural predispositions)? Given that individuals and teams must synthesize diverse scholarship from multiple disciplines to understand the daunting complexity of 21st-century globalization (see Ambrose, in press-b), do we need international, interdisciplinary collaboration to address some big questions such as the extent to which we are preparing the gifted for life in the complex, globalized 21st century?

## Examples of some insights gained from interdisciplinary projects in gifted education and creative studies

While I argue that more interdisciplinary work in the field is necessary there have been some efforts to inspire new thinking about giftedness and creativity by importing ideas from beyond our own borders. For example, Persson (2012) borrowed and integrated concepts from multiple disciplines in his analyses of the extent to which gifted education is

dominated by American cultural influences. Dai (2005; Dai & Chen, 2013) synthesized some work from multiple disciplines to analyze the structure and influences of conflicting paradigms in the field. Ambrose (2005a, 2012b) borrowed from economics, sociology, ethical philosophy, political science, and history to critique the corrosive influences of dogmatic neoclassical economic theory and runaway neoliberal ideology on gifted, creative young people. Latz and Adams (2011) recommended the use of interdisciplinary theorizing in the field to generate creative conceptual tension leading to context-sensitive differentiation.

Interdisciplinary work also has a niche in gifted education at the level of practice. Well-established curriculum integration initiatives encourage teachers and their students to cross disciplinary borders looking for interesting, productive connections (see VanTassel-Baska & Stambaugh, 2006; VanTassel-Baska & Wood, 2010).

Based on the belief that we need more integration with leading thinkers from disciplines beyond our borders, I have pursued two long-range interdisciplinary investigative trajectories. First, I've worked with some insightful collaborators to involve some prominent scholars from diverse disciplines in edited book projects revolving around thematic connections between ethics, dogmatism, complexity theory, and high ability (see Ambrose & Cross, 2009; Ambrose & Sternberg, 2012; Ambrose, Sternberg, & Sriraman, 2012; Ambrose, Sriraman, & Pierce, 2014). Second, I have imported insights from many other thought leaders in diverse disciplines, using them in authored books and articles to shed new light on the topic of creative intelligence. The following list provides a brief overview of a few insights imported into gifted education and creative studies through these projects.

Direct contributions to edited book projects from "outside" disciplines

- Military historian Andrew Bacevich (2012) described war as a crapshoot and showed how otherwise gifted, intelligent leaders can become dogmatic warmongers who push their societies into morally reprehensible conflicts with devastating consequences. He drew implications for gifted leadership.
- Sociologist Daniel Chirot (2012) showed how creative and otherwise intelligent but unethical leaders can use any blend of four impulses to whip a large population of followers into a murderous frenzy leading to genocide. This magnifies the importance of ethics in gifted education, especially when it comes to the development of leadership talent and identity formation among the gifted.
- Legal scholar Meir Dan-Cohen (2009) showed how the discovery and pursuit of projects and goals enable individuals to establish the boundaries of their personal identities.
- Political scientist Adam Martin and political philosopher Kristen Renwick Monroe (2009) discovered identity dynamics that can lead individuals to become less bound to their identity groups and more inclined to take a universalist-altruistic view of others who differ from them.
- Critical thinking experts Linda Elder and Richard Paul (2009) showed how some pernicious thought processes can deceive the self and others by substituting for ethical reasoning. They also revealed ways in which creative, intelligent, gifted individuals are not immune to dogmatism (Elder & Paul, 2012). Consequently, when their dogmatic thinking causes harm in the world, their talents can magnify the damage far beyond what ordinary dogmatic individuals could do.

Some of the other thinkers from outside disciplines contributing to these projects included philosophers Mark Johnson, Laurence Bove, Peter Pruim, and David White;

theoretical physicist Amit Goswami; psychologist Bob Altemeyer; urban planner Todd Juhasz; and environmental economist Tom Green.

## Borrowing indirectly from leading "Outsiders"

Aside from directly engaging prominent thinkers from other disciplines in collaborative projects I've edited on giftedness and creativity I've also simply borrowed the ideas of outsiders and integrated them into my own writings. The resulting books, articles, and chapters actually have extended the search into far more disciplinary territory than have the direct collaborations. For example, one book (Ambrose, 2009a) pulled together 72 theories and research findings from 29 academic disciplines and fields, and cross-referenced the constructs to discover ways in which ideas from one discipline can generate creative thinking in another. In this project I also connected the 72 theories and research findings with important constructs in gifted education and creative studies through the process of creative association. This generated additional embryonic, cross-disciplinary syntheses. For example, one creative mind collision connected the notion of *unearned merit* (mistaking inherited privileged status for impressive talent), which is drawn from economics, with research on the achievement of creative eminence drawn from creative studies. The hypothesis generated by this interdisciplinary creative association process was that arguments about the existence and importance of a "cognitive elite" (see Herrnstein & Murray, 1994; Murray, 2012) were flawed because mistaking unearned privilege for meritorious ability can put weak minds in positions of power while limiting the pool of potentially eminent creators.

The following are additional examples of creative associations and theoretical syntheses based on the borrowing of theory and research from outside disciplines:

- Insights from economists, political scientists, sociologists, legal theorists, social epidemiologists, critical thinking experts, and others, came together to generate portrayals of powerful, socioeconomic barriers to the discovery and development of high ability among deprived populations, especially in the most stratified developed nations such as the United States (see Ambrose, 2003, 2005a; 2008, 2012b).
- In focus chapters for two edited books (Ambrose, in press-a, in press-b), I pulled together research and theory from economics, political science, materials science, biotechnology, history, environmental science, philosophy, cultural anthropology, the history of science, archaeology, and biology to produce portrayals of enormous "macroproblems" and "macro-opportunities" generated by globalization. The analyses magnified the importance of intrapersonal self-discovery, talent development, and ethical awareness within and beyond gifted education.

Without this borrowing from disciplines revealing powerful influences from the large-scale contextual level of analysis mentioned earlier in this article, the pernicious effects of ideological extremism, economic corruption, and massive, societal problems and opportunities would be much less visible. Consequently, the underachievement of deprived populations would more likely be viewed as personal failings of individual children and unsupportive families instead of the egregious effects of dogmatic policymakers and deceptive market fundamentalists.

Is the field of gifted education sufficiently aware of powerful contextual influences on the discovery and development of high ability? Persson (2012) showed some ways in which gifted education is dominated by American cultural assumptions. If the United States is suffering from excessive democratic erosion and economic capture by elites, are the tenets of

progressive ideology (community building, distributive justice, and prudent economic regulation) increasingly marginalized due to the dominance of American cultural assumptions in the field? If so, what effect might that have on gifted young people who come from deprived or privileged backgrounds? Are there other large-scale, socioeconomic, contextual influences that we should magnify through interdisciplinary borrowing to reveal more nuances of talent development and identification of the gifted?

As it is currently evolving, globalization is generating unprecedented prosperity for some while also causing immense damage, which includes environmental devastation and unethical exploitation of billions of people by multinational corporations (see Sassen, 2014; Stiglitz, 2003). Does this magnify the importance of ethics in gifted education? If the gifted are to become knowledgeable, wise citizens who can pressure their leaders to participate in national and international guidance of globalization processes, will they need an education that combines the development of their aspirations and creative capacities with altruism, empathy, and ethical sensibilities? For more on the ethics-giftedness nexus see Ambrose and Cross (2009).

## Recommendations for expanding and strengthening interdisciplinary work in gifted education

In their broad scope analysis of interdisciplinary work, Wagner et al. (2011) argued that it is important for participants to identify the processes and contexts that can foster knowledge integration in research. This subsection includes some attempts to suggest some processes and contexts that might help researchers and theorists in gifted education find ways to capitalize on insights from other disciplines.

### a. Strive for Epistemological Pluralism

While highlighting some of the problems faced in interdisciplinary attempts to address environmental problems Miller et al. (2008) recommended an emphasis on *epistemological pluralism,* which would recognize the value of diverse ideas and problem-solving approaches from different disciplines. Such an approach would enable participants in interdisciplinary projects to recognize the value of work within the relevant disciplinary silos and to strengthen the connection-making among them, thereby enabling teams to address the transdisciplinary complexities of expansive problems that refuse to stay confined within a single silo. Epistemological pluralism also connects well with the concept of cognitive diversity (Page, 2007).

### b. Expand Our Vision to Avoid Dogmatic Escape from Reality

Another strategy that can encourage more interdisciplinary work might be the establishment of more due diligence when it comes to constructing and implementing research trajectories and theory. The due diligence would take the form of protecting ourselves against Shapiro's (2005) “flight from reality” by ensuring that we are not falling in love excessively with the rigour of our methodology or the aesthetic appeal of a particular theoretical construct. Again the value of cognitive diversity (Page, 2007) comes to the fore. Spreading the news about the value of cognitive diversity could encourage scholars in gifted education to embrace the value of diverse empirical and conceptual methodologies to the point where we guard against overvaluing quantitative empiricism; for example, at the expense of qualitative empiricism, theoretical synthesizing, and philosophical analysis. Given the potential benefits of extracting insights from multiple levels of analysis (Ambrose, 1998a, 2005b, 2009a; Ambrose, VanTassel-Baska, Coleman, and Cross, 2010), employing methodological eclecticism and triangulation to protect ourselves from a counterproductive

flight from reality seems wise. Such thinking could encourage us to borrow theories and investigative tools more readily from diverse disciplines.

## c. Be Aware of the Benefits of Both Narrow and Broad IDR

As the field pursues more interdisciplinary work it will have to grapple with some important questions. One of these is the form that interdisciplinary scholarship will take. Klein (2010), borrowing from William Newell, distinguished between narrow and broad or wide interdisciplinary (ID) work by discussing:

> a spectrum moving from partial to full integration, and the focus may be narrow or wide. *Narrow ID* occurs between disciplines with compatible methods, paradigms, and epistemologies, such as history and literature . . . . Fewer disciplines are typically involved as well, simplifying communication. *Broad* or *Wide ID* is more complex. It occurs between disciplines with little or no compatibility, such as sciences and humanities. They have different paradigms or methods and more disciplines and social sectors may be involved. (p. 18)

It is likely that both Narrow and Broad ID will be useful in the field of gifted education. Narrow ID might come into play when insights from a few other education-related fields are needed—insights from special education or educational administration, for example. Broad ID might be helpful, and be pursued with more vigour, when insights from multiple, diverse disciplines need to be synthesized to provide more expansive and accurate portrayals of contextual pressures on the gifted.

Current examples of inquiry methods conducive to Broad ID include graphic-metaphorical theoretical syntheses, which combine theory and research from diverse "foreign" disciplines into the form of 2-D or 3-D models. One of these is a circular ideological dial with healthy democracies at the top, totalitarian systems at the bottom, democratic growth moving upward through the ideologically moderate middle, and democratic erosion sliding down both the extremist right and left sides (Ambrose, 2005a; Yamin & Ambrose, 2012). The dial resides underneath a double-ended, ideological arrow showing the dynamic tension between right-wing and left-wing ideologies. This model synthesizes research and theory from political science, economics, sociology, history, and ethical philosophy to show the dynamics of democratic growth and erosion and the effects of varying ideological positions on the discovery of aspirations and development of talents among the gifted.

Another model shows an imaginary glass cube several thousand miles on a side and half-filled with earthen material with hills and valleys in various locations (Ambrose, 2009b). The landscape on the surface of the earthen material illustrates theoretical locations and movements of individuals, populations, and nations. The three dimensions of the cube represent the degree of malevolence or benevolence of an actor located somewhere on the landscape, the degree to which the actor generates damage or benefit in the world, and the ability and influence the actor can bring to bear on a society. The model incorporates scholarship from ethical philosophy, political science, economics, primatology, history, psychology, climate science, biology, and linguistics to generate ethical insights for creative studies and gifted education.

These Broad ID theoretical models fit Klein's (2010) description of *theoretical interdisciplinarity,* which incorporates "conceptual frameworks for analysis of particular problems, integration of propositions across disciplines, and new syntheses based on

continuities between models and analogies" (p. 20). This kind of complex, interdisciplinary work can help theorists, researchers, and practitioners to modify their constructs and practical methodologies. For example, employing the model of democratic erosion (Ambrose, 2005a; Yamin & Ambrose, 2012) to recognize the distortion of aspirations among the privileged gifted, and the crushing of aspirations among deprived, gifted young people, can suggest more nuanced ways to encourage intrinsic motivation and the long-term discovery of interest-based purpose. The models also fit the description of transdisciplinary inquiry, as opposed to interdisciplinary or multidisciplinary inquiry, as described by Wagner et al. (2011). Border-crossing academic work becomes transdisciplinary when it moves beyond exploration of concepts in different disciplines and works toward intricate integration of those concepts. Such in-depth integration is more ambitious and difficult than interdisciplinary or multidisciplinary work but it is potentially more productive.

## d. Use Metaphor as an Exploratory Tool and Thematic Integrator for Interdisciplinary Work

Metaphor has other roles to play in interdisciplinary projects aside from the development of the 2-D and 3-D visual-metaphorical synthesizers described in the previous subsection of this article. Metaphorical thought entails building a conceptual bridge between a source (well-known) concept and a target (little-known or unknown) concept (Lakoff & Johnson, 1980, 1999). Crossing the conceptual bridge enables a thinker or an audience to understand something about the target concept based on similarities with the source concept. The process enables us to learn more efficiently and to make creative, cross-disciplinary connections. A drawback is the tendency to overextend the similarities and ignore important differences between the concepts.

Most researchers and theorists think of metaphor as confined to language learning classrooms, especially in literature classes. However, scholars from multiple disciplines have revealed ways in which metaphor implicitly influences thinking within and beyond their fields. For example, Larson (2014), an environmental scientist, exposed both the benefits and drawbacks of metaphors used to explain scientific concepts in fields such as biology, the ecological sciences, sociology, psychology, and linguistics. One insight drawn from his analysis is the way in which metaphor becomes a powerful conceptual tool that can encourage various stakeholders to make assumptions that are incompatible with the science on sustainability.

In addition, metaphor often is essential for establishing the common conceptual ground necessary for interdisciplinary understanding and communication (Ambrose, 1996, 2012a; Arecchi, 1996; Bracken & Oughton, 2006; Galison, 2001; Sternberg, 1990). According to Galison, a historian of science, communicating across disciplines often requires simplification because constructs within disciplines can be complex and discipline-specific terminology can be arcane. Consequently, interdisciplinary communicators usually develop a form of *pidginization,* analogous to the pidginized language that forms between foreign peoples when they first make contact. Metaphor can simplify concepts and enable outsiders to understand the essence of constructs within an invaded discipline.

Aside from its communicative power, metaphor often is the catalyst for major discoveries in most disciplines, especially in the natural sciences (see Black, 1979; Boyd, 1993; Feist, 2006; Fields, 2006; Gruber, 1974, 1978, 1989; Gruber & Wallace, 2001; Haack, 1997; Hallyn, 2000; Holton, 1996, 1998; Kuhn, 1993; Miller, 1996; Spivey, 2008). In many cases, groundbreaking theorists employ visualizable metaphors to generate embryonic

theories and then refine and extend their ideas beyond what can be achieved by their less-imaginative peers who lack the ability or predilection for visual-metaphorical thinking.

But metaphor in the natural sciences, and in other disciplines, isn't immune to the drawback mentioned earlier: the tendency to overextend similarities and ignore important differences. For example, Fields (2006) showed how the metaphor of the neuron as a networked computer microprocessor generated misconceptions about the structure and dynamics of the human mind.

Understanding the unrecognized deceptiveness of metaphor is extremely important because metaphor permeates thinking in virtually all areas of human endeavour, including academia at the deepest, most implicit level. At this level, metaphor takes the form of four alternative root-metaphorical world views: mechanism, organicism, contextualism, and formism. Individuals, problem-solving teams, or entire academic disciplines and professions can become trapped within one of the world views and miss potential insights available through one or more of the other metaphorical perspectives (see Ambrose, 1996, 1998a, 1998b, 2000, 2009a, 2012a, 2014; Gillespie, 1992; Pepper, 1942). For example, the machine metaphor of the mechanistic world view inclines thinkers to view the human mind as machinelike, reducible to component parts, and amenable to precise prediction and control. In contrast, the metaphor of the organicist world view (developing, living system) encourages appreciation of long-term development and the integrative connections among the cognitive, emotional, and motivational aspects of mind. Each world view perspective can generate some progress toward understanding the human mind but marginalizes some important phenomena. Complex phenomena, including giftedness, require contributions from all four of the world views. Interdisciplinary excursions can reveal the ways in which the dominance of a world view in a particular discipline can simultaneously help and hinder progress. For example, the ethnographic work of cultural anthropology is deeply rooted in a blend of the organicist-contextualist world views while quantitative-empirical work in neoclassical economics and psychology is dominated by the mechanistic world view.

## Problems with interdisciplinary work

We often hear that academics won't do interdisciplinary work because promotion and tenure requirements keep them locked within their domain-specific silos. In addition, once they attain tenure their chances of gaining additional professional influence and recognition rest on building a notable body of work within the chosen domain. Wandering into the terrain of other disciplines simply wastes time and effort by rendering their work, no matter how impressive and groundbreaking, much less visible to their peers who tend to remain silo-insulated.

Another difficulty comes from the language barriers at the conceptual borders between disciplines. As mentioned earlier, those attempting interdisciplinary collaboration often must resort to creating some pidginized wording because the terminology in one discipline can differ significantly from that used in another (see Galison, 2001). Also, this problem with terminology is a symptom of another, more difficult problem with interdisciplinary work. Baer (2012) pointed out that becoming an expert in a domain takes considerable work so becoming sufficiently knowledgeable in multiple domains is exceedingly difficult. This makes interdisciplinary thinking prone to conceptual errors. Gardner (2011), echoed these concerns about the need for sufficient expertise within domains relevant to an interdisciplinary problem: “while I greatly value interdisciplinary work, such

work, cannot be undertaken thoughtfully unless the groundwork has been laid in the constituent disciplines" (p. xix).

Interestingly, the recent emphasis on domain specificity in both gifted education and creative studies (see Baer, 2012a, 2012b; Subotnik, Olszewski-Kubilius, & Worrell, 2011) could encourage the field to pursue both a narrow-deep and broad-interdisciplinary agenda. The emphases on domain-specific talent and expertise can encourage some interdisciplinary thinking in the field because we need to explore and to appreciate the structures and dynamics of diverse disciplines to understand the connections between domain specificity and high ability (see Horowitz, Subotnik, & Matthews, 2009). This need could represent an opportunity for a high-potential connection between two opposing impulses in the field, the impulses toward centripetal domain specificity, and those toward centrifugal interdisciplinary exploration.

## Concluding thoughts

These problems with interdisciplinary exploration raise very real concerns; however, they should be balanced with recognition of the significant advantages of interdisciplinary work mentioned earlier in this article such as the innovation coming from the transition from insular, domain-specific science to international, interdisciplinary scientific collaboration (Suresh, 2013); and the way in which interdisciplinary work can capitalize on the problem-solving power of cognitive diversity (Page, 2007, 2010). In contrast, staying excessively silo-bound aligns with the old, early to mid-20th-century version of academia. That said, as mentioned in the previous subsection we certainly do need to pay serious attention to what's in our own silo.

In addition, there is yet another reason why interdisciplinary work could be particularly vibrant in gifted education. Through my interdisciplinary collaborations I've noticed that our field provides a unique opportunity. Eminent scholars from "foreign" disciplines may be less than willing to participate in interdisciplinary collaboration when it comes to most topics but they seem to be more willing to participate when the topic has to do with high ability and its connections with topics such as dogmatism or ethics. They have an affinity for exceptional intelligence because they are exceptionally intelligent themselves and they want their students to become as intelligent as possible. Although many of them might think little about gifted education, if they think about it at all, some topics relevant to our field tend to capture their imagination and make them want to help us guide tomorrow's brightest minds toward productive aspirations. Consequently, some of the world's leading minds in history, sociology, political science, philosophy, legal studies, and other fields joined us in our explorations of the ethical dimensions of giftedness (Ambrose & Cross, 2009) and the dogmatism-giftedness/creativity nexus (Ambrose & Sternberg, 2012; Ambrose, Sternberg & Sriraman, 2012). Extending interdisciplinary work in the field beyond these projects will be worth pursuing. In so doing, we can generate refinements that can expand and strengthen the conceptual frameworks for the field.

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**Don Ambrose** is professor of graduate education at Rider University in Lawrenceville, New Jersey, and editor of the *Roeper Review*. He serves on the editorial boards of most of the major journals in the field of gifted education and for several book series. He has initiated and led numerous interdisciplinary scholarly projects involving eminent researchers and theorists from gifted education, general education, creative studies, cognitive science, ethical philosophy, psychology, political science, economics, law, history, sociology, theoretical physics, and critical thinking. Some of his recent books include *Creative Intelligence in the 21st Century: Grappling with Enormous Problems and Huge Opportunities* (with Robert J. Sternberg); *Giftedness and Talent in the 21st Century: Adapting to the Turbulence of Globalization* (with Robert J. Sternberg); *How Dogmatic Beliefs Harm Creativity and Higher-Level Thinking* (Routledge, with Robert J. Sternberg); *Confronting Dogmatism in Gifted Education* (Routledge, with Robert J. Sternberg and Bharath Sriraman); *Expanding Visions of Creative Intelligence: An Interdisciplinary Exploration* (Hampton Press); *Morality, Ethics, and Gifted Minds* (Springer Science, with Tracy L. Cross); *The Roeper School: A Model for Holistic Development of High Ability* (Sense, with Bharath Sriraman and Tracy L. Cross); and *A Critique of Creativity and Complexity: Deconstructing Clichés* (Sense, with Bharath Sriraman and Kathleen Pierce). Projects currently in press and under construction include a book of new teaching strategies based on constructs derived from various academic disciplines. In a "past life" he was an educational administrator in Western Canada.

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**Commentary (1):**

# Energizing Conceptual Foundations in Gifted Education through Transdisciplinarity

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**Keywords:** Interdisciplinarity; transdisciplinary; gifted; methodologies; foundations; collaboration.

The challenge that Don Ambrose presents to the field of Gifted Education to consider interdisciplinary work with colleagues in other academic fields seems timely and well-founded. A brief history of Gifted Education places its conceptual foundations within Psychology and Education. In the early 20th century, Gifted Education gained visibility and viability based on seminal works such as Galton's *Hereditary Genius* in 1869, the Binet-Simon Scale in 1905, and Terman's *Genetic Studies of Genius* in 1925. In the United States, systematic public education in Gifted Education began in St. Louis, Missouri, in 1868, followed by the first special school for gifted in Worcester, Massachusetts, in 1901, and Hollingworth's Special Opportunity Class at P.S. 165 in New York City in 1922 (NAGC, n. d). These early foundations suggest interdisciplinarity between Gifted Education and the fields of Education and Psychology. Shared concepts include modification of instruction for advanced learners, psychometrics for an exceptional population, and research on intelligence. Ambrose distinguishes a spectrum of terms related to collaborative work with *multidisciplinary* as the least integrative, *interdisciplinary* in the middle, and *transdisciplinary* as the most integrative. However, he uses *interdisciplinary* in a broad sense that encompasses all three types of collaboration among the disciplines. Since the early development of Gifted Education incorporated foundational concepts and research methodologies from Psychology and Education during the past 100 years, then perhaps a discussion of *transdisciplinarity* as the most integrative collaboration could prove useful during the next century. My commentary on Ambrose's paper considers the background of transdisciplinarity in Psychology and Education, transdisciplinarity in the Humanities, Second Language Learning in particular, and practical considerations for transdisciplinarity in Gifted Education in the real world.

## Transdisciplinarity scholarship in complex systems

To more fully appreciate the benefits and pitfalls of transdisciplinarity between the field of Gifted Education and other disciplines, I studied its beginnings in higher education. The term itself came into use in 1994 when the Swiss developmental psychologist Jean Piaget advocated for its practice during the First World Congress of Transdisciplinarity (Janz, 1998). Piaget considered *transdisciplinarity* a superior stage of interdisciplinarity that exits within a complete system without stable boundaries between academic disciplines (Nicolescu, 2006). Basarab Nicolescu founded the International Centre of Transdisciplinary Research and Studies (CIRET) in Paris in 1987, and he passionately advocates

transdisciplinarity in order to reconcile disciplines in the sciences and humanities. Transdisciplinarity offers an approach that avoids the extremes of fragmentation and closed-thought systems created by specialization within disciplines (CIRET, 2015a). The primary purpose of CIRET is to develop research within an atmosphere of knowledge that flows freely between specializations. CIRET elaborates further on its goals in its seven-point Moral Project. The Moral Project provides a rationale for transdisciplinarity due to advances in technology and changes in logic and epistemology, especially within the fields of biology and physics (CIRET, 2015b). CIRET attempts to create a coherent world view for complex systems rather than endure the insularity found in the research silos of highly specialized fields.

At the First World Congress of Transdisciplinarity, founding members adopted a 14-article *Charter of Transdisciplinarity* edited by de Reitas, Morin, and Nicolescu (1994). This charter captures a number of the same benefits, issues, and pitfalls that Ambrose discusses: openness beyond the empirical sciences with a demand for dialogue with humanities (Article 5), an approach that equalizes all cultures (Article 10), and principle characteristics of transdisciplinarity vision and attitude identified as *rigor, openness, and tolerance* (Article 14) (de Reitas, Morin, & Nicolescu, 1994). All descriptions of transdisciplinarity include three common core elements: a belief system in *levels of reality*, redefined Aristotelean logic as a law of *included* rather than excluded, and *complexity* as the primary feature of knowledge (Janz, 1998). The *Charter of Transdisciplinarity* provides guidance for researchers in Gifted Education engaged in professional knowledge bases, theoretical constructs, investigative methodologies, interdisciplinary teamwork, and publishing projects across disciplines in order to avoid faulty metaphors, insularity, and escape from reality concerns that Ambrose discusses in his paper.

## Collaborative integration in the humanities

When Ambrose presents examples of interdisciplinary work conducted in the natural sciences, psychology, and social sciences, he expresses the need to avoid *discipline envy* often incurred by "soft" disciplines such as the humanities and the "hard" natural sciences. However, if we consider all academic disciplines of equal value in transdisciplinaritive research, then specializations within the humanities offer complex systems worthy of transdisciplinary work. For example, educators and researchers in Gifted Education find common ground with the thinking concepts and critical analyses found in Literature and Language Studies. In Theater and Drama disciplines, we find aspects related to human behavior and philosophy of relevance to Gifted Education. The fields of Art, Dance, and Music provide perspectives on creativity and communication that enhance conceptual foundations and research methodologies in Gifted Education. In school classrooms, teachers of the humanities implement instructional practices based on behaviorism, cognitive theories, and sociocultural theories. Researchers in Gifted Education may benefit from investigative methodologies such as examination of artifacts and active engagement with cultural groups in the humanities. A sampling of potential collaborative publishing projects includes analyzing protagonists identified as gifted in Literature and Language Arts, teacher-learner relationships in humanity subject classrooms, and assessment of excellence in academic disciplines or creative domains related to the humanities. Instances of pitfalls of and barriers to transdisciplinarity such as Shapiro's Flight from Reality occur in the humanities as well as in the empirical sciences. For example, Reed-Kellogg sentence diagramming used in schools mechanistically applied visual representation to grammar in an attempt to gain precision in a changing and complex system. Linguist Noam Chomsky revolutionized the field by

introducing transformational grammar in 1957 with its deep and surface meaning tree structures that focuses on a human innate capacity to generate language through an internalized set of rules. The Chomsky Hierarchy (1956) defined four types of grammar structures that encompass modern societies such the Type 0 formal grammar of Alan Turing's Enigma machine (Gibbon, 1997; Sale, n. d.).

Within the humanities, the academic discipline of Second Language Learning presents a complex system that involves both coding and evolving communication about self, others, and the world. Researchers and educators in Gifted Education may examine theoretical constructs such as diversity and cultural-intercultural in order to expand the edges of Gifted Education. The Sapir-Whorf Hypothesis, initially formulated in 1929, illustrates how individuals interpret a world shaped by languages whose structures vary from one to another. Within Gifted Education, researchers and educators can apply understanding from this model to improve teaching and learning. Intercultural language concepts such as active construction, making connections, interaction, reflection, and responsibility apply to Gifted Education classrooms that need to engage and to challenge advanced learners. S*ituatedness* within a first language influences communication with other cultural and language groups in the world. This positioning creates complexity and sophisticated awareness by observers who interpret the communication of other language speakers while at the same time deepening understanding of themselves (Scarino & Liddicoat, 2009). Second Language Learning pedagogy such as language immersion and reflective thinking provide insight across the disciplines through recognition, mediation, and acceptance. The behaviorist learning theory in Second Language Learning includes imitation, practice, encouragement, and habit formation and applies to some instances in Gifted Education. Educators of advanced learners can use these strategies to motivate underachieving or twice-exception learners when teachers model metacognition, to provide accelerated and enriched learning experiences, to address self-efficacy, and to assist learners with self-regulation practices.

## Practical considerations in the real world

Ambrose envisions productive partnerships on the edge of the chaos-order continuum. The Mayo Clinic provides a real world example of a medical institution that bases its expertise on effective integrative collaboration. This renowned facility uses an integrated practice model in a complex system of health care, medical research, and education. A plethora of specialized doctors under one roof routinely consult and collaborate with one another to achieve the best health care for their patients. Their commitment to the integrated practice model places the Mayo Clinic in top national rankings in a number of medical specializations. In the same way, institutions of higher education are structured by specializations within complex systems; yet, as Ambrose indicates, academic disciplines in higher education often remain closed within their silos of professional knowledge and research interests. From a practical perspective, the tenure and promotion system requires university professors to "publish within their fields" if they wish to achieve tenure and to gain promotion. However, institutions in higher education consider grant writing among colleagues from different disciplines an asset rather than a deterrent to academic rigor. An early model of *Creative Problem-Solving* developed by educator Sidney Parnes and advertising executive Alex Osborn provides an example of transdiscipinarity actively used in the real world. Despite various obstacles to transdisciplinarity among colleagues in higher education, its potential benefits become especially viable given the explosive spread of knowledge and limited resources. To further enhance productivity, university professors who

experience a number of career changes and possess multiple background experiences become themselves “intrapersonal units” in the transdisciplinary process.

Ambrose stimulates educators and researchers in Gifted Education toward mindfulness in their practices of theoretical development, curriculum and instruction, counseling, and research methodologies. The advantages to transdisciplinarity work include synthesis of knowledge across disciplines rather than fragmentation. In the modern world, academic disciplines are unable to know everything. Transdisciplinarity makes dialogue among scholars possible, irrespective of their professional obligations or institutional interests (Janz, 1998). Transdisciplinarity encourages colleagues to share insights into their respective conceptual frameworks and to adopt common terminology in research methodology. When beginning transdisciplinary work, educators, and researchers in Gifted Education need guidelines to enhance the experience and to avoid pitfalls. For example, avoidance of too much restrictiveness or an excess of chaos when borrowing insights from other disciplines seems prudent. We can maximize productivity by focusing on one component from another discipline such as concepts from theoretical frameworks, shared research methodologies, or effective curriculum and instructional practices. Though a relatively young academic discipline, Gifted Education has successfully integrated concepts and practices from Education and Psychology for more than a century. Forming transdisciplinary partnerships in the humanities as well as the Sciences will energize, invigorate, and enlarge Gifted Education in a changing world in ways yet to imagine.

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**Commentary (2):**

# A Voice of Sanity in the Arid Land of Dogmatic Systems

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**Keywords:** Science in transition; accountability; neoliberalism; inter-disciplinarity; dogmatism; academic freedom; the hegemony of method.

I rarely grow excited nowadays when reading scholarly literature. The research reported in the annals of education and psychology tends to be a variation on never-ending themes. While true that some scholarly work remains impressive still, it rarely communicates a sense of exploration; a search for new terrain, or an impatience with models that really do not fit reality or making good sense. Don Ambrose's article is different. It is inspiring. It has everything a scholarly article should have: It is impressive; it most certainly is exploring new territory, and the author is indeed impatient with the current status quo of scholarly work which rarely seems to be leading anywhere. Ambrose's article is an avalanche of common sense and keen observations combined with insightful suggestions on how to proceed in generating insight and sustainable new knowledge for the future. Writing such as this excites me indeed. It should all have been said already a long time ago. The fact that it has not is nothing short of scandalous (See Gintis, 2007, who makes this point).

However, there are explanations as to why this status quo persists. The void of new and daring thinking does not necessarily reflect a lack of brilliance, initiative, and creative thought in the scientific community of scholars. The current vacuum of fresh insight rather reflects the professional reality in which many scholars are currently forced to exist. These conditions, in turn, generate systems thriving on dogmatism and sustaining narrow-minded knowledge monopolies (Bauer, 2012).

Well over 100 years ago, Max Weber admonished the scholars of his day to vehemently oppose the view that it is possible to be 'scientifically satisfied' with broadly defined values that we, by convention, take for granted. The particular task of science, it seems to me, is the very opposite namely, to question that which convention is taking for granted (as quoted by Adler-Karlsson, 1997, p. 17).

This is a golden rule in scholarly work that has long since been abandoned by far too many. Needless to say, questioning conventions remains an important part of scientific discourse; but unlike the scholars of Weber's era, we now have established rules stating what can be questioned and what cannot. These are the formal rules of scientific methodology and scholarly writing which are now more or less globally required and, in addition, usually need to be communicated in English.

Scholars of today often dare not say what they actually think or communicate what they really believe for fear of being regarded as "unscientific" and by extension also be accused of lacking in "quality." With Science Quality Controllers breathing down our necks, we pursue research in a way, not so much as to break new ground, but rather to satisfy employing universities, funders and national authorities who all insist we use

their funding and support effectively and according to certain standards decided by them rather than by ourselves. In addition, when applying for research funding (at least in Northern Europe), you are required to outline 'preliminary results' when submitting an application. If we explore new territories, try new ideas, and wish to investigate something that no one has ever tried before, how can we—if in the application for funding—must first tell grant givers our results for their approval and then guarantee that we are financially efficient at the same time? In other words, funders wish to eliminate risk and demand given guarantees that money are effectively spent. While this makes much sense to accountants it makes no sense whatsoever to anyone involved in creative processes. Risk is what any scientist must take if they are to achieve anything at all that will substantially add to knowledge.

In the 1970s, as Kolstoe (1979) somewhat facetiously remarked, a real university was characterised by allowing a climate in which new fragile ideas could be tried and cultivated even though there were no guarantees that research plans would be successful. Such risk-taking is no longer welcome at most contemporary universities. Neither lower rankings nor loss of funding are acceptable due to researchers devoting themselves to the "wrong research." In short, we now have places of learning and research integrated into the industrial complex and managed much like any other industrial production process (Nocella, Best & McLaren, 2010). I suspect, however, that scholars exist under slightly different conditions in different parts of the world. For example, important differences between North America and Europe are differences in how universities and research institutions are run and funded. Unlike in Canada and the United States, European education and research are often heavily reliant on state funding derived from national taxation. This means that budgets are allocated by state authorities. With any allocated funding comes dependence, quality management, and control of function, objectives, and results—the cost of which to higher education and science is the loss of academic freedom (Rider, Hasselberg & Waluszewski, 2013).

In considering Ambrose's suggestion for progress towards a more eclectic future of research, it is important to understand the degree to which a university is independent relative to its country's politics and governmental authority. That which is perhaps permitted at a privately run and funded American liberal arts college might not be welcomed at a state-subsidised research university in London, Berlin, or Stockholm.

## The dark side of standards and systems

I second every observation that Ambrose makes in his article, but I think that one important issue is overlooked – perhaps because of the impossibility of covering every aspect in only one article. While I agree that the systems currently constituting science and education until now have been frustratingly inadequate and have resulted in limited progress, I also think that creating *new* systems and research paradigms is not likely to much improve the situation—even if those systems are more open-ended and accepting of new multi-disciplinary thinking.

It is crucial that researchers start putting the enormous puzzle of scattered knowledge pieces in all disciplines together. For this gigantic undertaking we must, as Ambrose points out, work together. But working together how? Ambrose himself (in Ambrose & Sternberg, 2012) eloquently acknowledges, that in the emerging global knowledge economy, dogmatism in science has become largely the standard by which quality is often measured in the academic world.

In my own academic experience as a doctoral student many years ago, one of my thesis supervisors, world famous in his field, had a tendency to teach one thing and demand students abide by it, then behaved quite differently his own work as a scientist. This apparent hypocrisy certainly impacted my regard for the academic supervisor, and the double standard puzzled me.

Much to my chagrin, I find that I maintain somewhat of a double standard as I now teach my own students in the different fields of psychology and research methodology. To some degree, I teach contrary to how I actually work and reason as a scientist. I am required to. The ministry of education and its quality control department demand academic disciplines to be "pure," meaning they must have a certain standard content recognised by consensus within each discipline. Its research must at all costs be characterised by typical and generally accepted methods. However, unlike my former professor, I tell my students that textbook realities and ministry standards of excellence do not always agree with a research reality.

It is much the same in the world of high-impact scholarly publishing. Try submitting a well-designed and stringent qualitative study to any of the major psychology journals, and you will have your manuscript refused on the grounds that your study is "unscientific" due to choice of methodology. Or submit a meticulously considered study on a subject that no one has considered before and you may receive a comment such as the one I received from a reviewer of a well-respected scholarly journal in education: "This is an entirely new topic for me. We do not know anything about this. Therefore, this study is completely unscientific and should not be published." I both laughed and cried at this comment. If what the reviewer said were actually true, science would be re-inventing itself repeatedly and never develop in any direction. Perhaps this is largely where we are in gifted education and in the social and behavioural sciences in general.

These and similar problems have been recognised for many years. I believe the Nobel Prize Laureate Peter Medawar (1964) was one of the first to accuse scholarly publications for being fraudulent, not necessarily because of arrived-at conclusions and results but because articles more or less *misrepresented* the actual research process. That which we report in writing is what others in the community of scholars expect or even demand that we report. This is not necessarily representing what we actually did. Most of the creative process that went into to the research process is probably unaccounted for because it is rarely replicable or even of interest to the gatekeepers of scientific quality.

Who would accept and publish as scientific the discovery of the double helix of DNA being the result of a series of lengthy discussions over beer in a public house or take seriously the discovery of benzene as a hexagonal molecular structure if discovered in a daydream of snakes biting each other's tails? Yet, as Weisberg (1993) reports, these examples actually happened: James Watson and Francis Crick spent many hours in a pub mulling over what the structure of DNA might be like and solved it and August Kekulé's serendipitous imaginings of reptiles helped resolve the molecular structure of benzene.

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For every effort we make to standardise and produce structures for everyone to fit into and for every rule we decide to define science and scientific quality, we simultaneously lose our freedom to individually think, act, create and imagine. External control is anathema to creativity.

## Maybe a little bit of scientific anarchy?

I am certain most have heard of science philosopher Paul Feyerabend (2010), who in his time outrageously argued against the hegemony of the scientific method. He was convinced that prescriptive rules in science limit the activities of scientists and therefore also limit progress. He proposed a kind of scientific anarchism. I was as outraged as everyone else at this suggestion. If there is no method, then do we still have science? However, having been around long enough by now to see how method has become increasingly more important than the questions we ask and that the quality of a research effort now mainly lies in how dogmatically we deal with method, I have good reason to agree with Feyerabend. While I would not discard method, I do think our priorities are very wrong. The mere fact that many universities globally offer advanced degrees not in subjects, applications, or disciplines but in research methodology *only*, is indeed alarming. It speaks volumes about how we have detached method from subject matter. By so doing, how can we expect to accomplish anything at all?

A cursory historical retrospection would be useful, I think. Discoveries made since antiquity were not usually the results of commonly agreed-upon conventions about how research must be operationalised in order to be considered "scientific." Philosophers, thinkers, and explorers were inquisitive and wanted to know and understand ideas or phenomena that intrigued them. By careful observation and gathering data as they saw fit, these researchers came to astounding conclusions—some of which are valid still. They produced their own methods because of need, and were, in a sense, living the anarchy of which Feyerabend speaks. Even Skinner (1956) was aware of this and astutely commented that here was a first principle not formally recognised by scientific methodologists: "When you run into something interesting, drop everything else and study it" (p. 223).

Rather than to create new paradigms, rules, structures, and standards for the scientific endeavour, we need to take seriously Feyerabend's suggestion. In shedding dogmatism in order to eclectically synthesise the enormous database we have at our disposal if abandoning traditional disciplinary boundaries, we also must disregard many, if not all, canons of quality and scientific methodology. It is important that we do not create new ones, painting ourselves into a corner again. But, is this at all possible? My own conviction is that it is not; at least not on a grand global scale engaging all of established and institutionalised academia. The political fabric into which science and education have been fully integrated in post-modern society—and upon which science and education have become increasingly dependent—is not likely to change in favour of the direction suggested by Ambrose.

It is already the case that quite a few scientists lead double lives: One in which they fulfill contractual obligations towards their employing university and one in which they more freely explore their own independent—and unpaid—ideas. That is, if they still have time and energy after fulfilling contracted time and production. So, whilst the development and direction Ambrose suggests is highly desirable and necessary, I also think that it unfortunately will not be welcomed by most universities and research institutions assumed to support the global economy and on occasion also political development.

## Concluding thoughts

My conclusion is, after having read and digested Ambrose's *tour de force,* is that his proposed development will have to be pursued largely *outside* of the official, standardised and bureaucratised world of universities and colleges and also without becoming entangled in the suffocating bureaucracy of demands and control that inevitably come with officially

granted research. With the exception of publication in a few particularly open-minded scholarly journals, research results, applications, and theoretical discourse will have to be shared and communicated as open access, online and, importantly, beyond commercial publishers and the bibliometric quality markers so cherished by universities, authorities and markets as signs of quality for the sake of marketing.

As White (2000) explains, Leonardo da Vinci is an interesting example in this regard. While his art and science were complementary, one earned him an income and the other gave him understanding and insight. Even the most obvious icon of science, Albert Einstein, represents a similar example according to Neffle (2007). A bored Einstein worked at the Swiss Patent Office to have an income but privately sought his inspiration elsewhere. Quite informally, Einstein started a discussion group of like-minded friends called the Olympic Academy who met regularly and discussed the science and philosophy of the day. Eventually, Einstein pursued a more traditional academic career starting as a lecturer at the University of Bern. Another giant in the history of science, Charles Darwin, had the fortune of being born into a family of means. In time, Darwin needed a job and reluctantly accepted a position as secretary to the Geological Society in London. But Darwin made no attempt at an academic career, and his explorations and research were never connected to a university or academic environment according to Desmond and Moore (1992).

Prior to the era of the global knowledge economy when academic freedom was still assumed as the norm and no one really cared about "quality," "efficiency," or "excellence," all three apparently seemed to emerge anyway from scientists of extraordinary insight and impact. Unless there is a sudden revolutionising change of attitude and conditions for employment in the global world of science, I sadly think that we can expect less new thinking and substantive breakthroughs from universities and state-subsidised and controlled research efforts. Within our institutions, we are certainly capable of generating new thinking and substantive breakthroughs, but only if the creative mind is allowed to. Until such a change is made to state-subsidized and controlled research, the developments proposed by Ambrose will have to be pursued, presumably, idealistically and beyond the financial controls and influence of the global economy and its governors.

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**Commentary (3):**

# Consilience: A Response to Ambrose's Notion of "Borrowing Insights"

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**Keywords:** Consilience; induction; gifted education; Whewell; Snow; Wilson.

## Introduction

Ambrose (2015, p. 33) asks, "Should the field of gifted education reach beyond its own borders to engage in more interdisciplinary work?" His idea is that our conception and understanding of the education of gifted students and phenomena related to high ability should be, would be, strengthened if we were to borrow (and beg and steal, perhaps?) and to apply theoretical and research-based insights and vistas from disciplines other than "gifted education", such as the social sciences, the humanities, and the natural sciences. In the spirit of interdisciplinary approaches, such conceiving and understanding could begin to take place if there was to occur, not so much a borrowing, but rather an engagement among the sets of horizons of the various disciplines, a merging of the ways in which each understands and interprets the world around. Gadamer (1975, pp. 286–290) calls this a "Horizonverschmelzung – a fusion of horizons".

In a conciliatory if not brave gesture, Ambrose (2015, pp. 34) opens up the debate for others to respond and "to suggest some additional opportunities for this kind of work." He mentions, inter alia, that, as a field, gifted education is "atheoretical" but may be even more "aphilosophical". This thought arises from an examination of four different analytical levels (practice, research, theory, and philosophy) conducted by Ambrose, VanTassel-Baska, Coleman, and Cross (2010) using an interdisciplinary investigative framework. One of their conclusions was, "The level of philosophy is disconnected from the other levels because so few professionals attend to it" (Ambrose et al., 2010, pp. 471–473; see also the Figure on p. 472).

Hence, in my response to Ambrose (2015), I would like to suggest, as an "additional opportunity", two historical precedents, and a related philosophical conceptual framework for interdisciplinary approaches for gifted education. These precedents and this conceptual framework are encapsulated in the term "consilience".

## Consilience

According to the *Concise Oxford English Dictionary*, consilience means "Agreement between the approaches to a topic of different academic subjects, especially science and the humanities." The word is a neologism from the mid-19th century, derived from Latin *cum* (with, together, jointly) and *salio* (to leap, bound, spring, jump) (Lewis & Short, *A Latin Dictionary*). As a concept or construct, its underlying rationale is an understanding of the unity of knowledge: if you use two, or even more, methods to measure or to collect data about a phenomenon, you should obtain the same results or findings about that phenomenon.

Hence, in both the humanities and the sciences, consilience refers to the notion that evidence derived from multiple-independent sources converges to a conclusion or theory that is more plausible than if the evidence was derived from fewer sources or from dependent or related sources. This principle holds even when few, if any, of the individual sources provide strong evidence in their own right, so long as the multiple sources of evidence are in agreement. In fact, most scientific knowledge relies on such a convergence and concordance of evidence, on consilience, to be plausible or to find general scientific consensus to be established as a theory. A topical and excellent example of consilience in science is the evidence for global warming and climate change.

## The polymath Whewell

The source of the concept and term "consilience" takes us back to the mid-19th century and the work of William Whewell (1794–1866). Whewell was what we would call, without any stretch of the imagination, a polymath. His voluminous writing on a wide range of topics in science and philosophy spanned 35 years. He was a minister of religion who was acclaimed for his work in theology and philosophy. He was a scientist, conducting research and writing in the fields of geology, physics, mechanics, astronomy, and ocean tides, as well as writing on the history and philosophy of science. He was an academic and university administrator, at various times holding the positions of Professor of Mineralogy and Professor of Philosophy, as well as Master of Trinity College, in the University of Cambridge (UK). He was a Mathematician, still known for his equation for a function in terms of the arc length and the tangential angle of the curve it describes, and hence essentially independent of a coordinate system. He was a poet in his own right, and translator of Goethe. Many neologisms were introduced in his published writings and in his correspondence with other scientists and philosophers: general terms, such as consilience, physicist, scientist; and specific terms such as anode, cathode, dialectric and ion. For a biography of Whewell, I recommend Fisch (1991), which I have relied on for this biographical sketch.

Whewell's book, titled The philosophy of the inductive sciences, founded upon their history, first appeared in 1840 (it took me less than one minute of searching to locate and download from the Internet facsimile copies of both volumes of the second edition, Whewell, 1847). In their 1400 pages, these volumes draw together a remarkable range of wonderful examples of consilience from across the science disciplines (my favourite is the story of Kepler and the elliptical orbit of planets). In fact, Whewell (1847) originally introduced the concept of "consilience" in the expression "consilience of inductions," referring to a "jumping together" of knowledge. First, he defined this expression in the following way:

> *The Consilience of Inductions* takes place when an Induction, obtained from one class of facts, coincides with an Induction, obtained from another different class. This Consilience is a test of the truth of the Theory in which it occurs (Whewell, 1847, Vol. II, p. 469, Aphorism XIV, italics in original).

Then, second, he recognized the strength of conceiving of "Induction", or the method of scientific discovery, as:

> not the mere sum of the Facts which are colligated [syntactically bound together or juxtaposed]. The Facts are not only brought together, but seen in a new point of view. A new mental Element is *superinduced*; and a peculiar constitution and discipline of mind are requisite in order to make this Induction (Whewell, 1847, Vol. II, p. 469, Aphorism XV, italics in original).

And third, important for the field of gifted education and for Ambrose's project, Whewell appreciated that:

> The Consiliences of our Inductions give rise to a constant Convergence of our Theory towards Simplicity and Unity (Whewell, 1847, Vol. II, p. 74).

Because of the historical importance of Whewell's contribution to the development of the concept of consilience, I think that it is important to cite the original at length:

> We have spoken here of the prediction of facts *of the same kind* as those from which our rule was collected. But the evidence in favour of our induction is of a much higher and more forcible character when it enables us to explain and determine cases of a *kind different* from those which were contemplated in the formation of our hypothesis. The instances in which this has occurred, indeed, impress us with a conviction that the truth of our hypothesis is certain. No accident could give rise to such an extraordinary coincidence. … That rules springing from remote and unconnected quarters should leap to the same point, can only arise from *that* being the point where the truth resides. Accordingly the cases in which inductions from classes of facts altogether different have thus *jumped together*, belong only to the best established theories which the history of science contains. And as I shall have occasion to refer to this peculiar feature of their evidence, I will take the liberty of describing it by a particular phrase: and will term it the *Consilience of Inductions* (Whewell, 1847, Vol. II, p. 65, italics in original).

## Snow's two cultures

For about one hundred years, Whewell's concept of consilience lay mostly dormant until Snow (1956, 1959) examined the culture gap between "the two cultures," the sciences and the humanities, in a range of articles and activities including his Rede Lecture, 7 May, 1959. Sir Charles Percy Snow (1905–1980) was a physical chemist, a novelist, a public servant, a politician, and a peer. A sensitive biography of Snow was published by his brother Philip Snow (1982).

The thesis of Snow's (1959) *The two cultures* was that:

> the intellectual life of the whole of western society is increasingly split into the two polar groups. … Literary intellectuals at one pole – at the other scientists … . Between the two a gulf of mutual incomprehension – sometimes … hostility and dislike, but most of all lack of understanding (Snow, 1959, p. 4).

His point was that this lack of understanding is dangerous: the gulf between the humanities and the sciences was a major hindrance to solving the world's problems, such as peace, poverty, and development. "This polarisation is sheer loss to us all. To us as people, and to our society. It is at the same time practical and intellectual and creative loss." (Snow, 1959, p. 12.) To highlight the enormity of this issue, Snow related the following story:

> A good many times I have been present at gatherings of people who, by the standards of the traditional culture, are thought highly educated and who have with considerable gusto been expressing their incredulity at the illiteracy of scientists. Once or twice I have been provoked and have asked the company how many of them could describe the Second Law of Thermodynamics. The response was cold: it was also negative. Yet I was asking something which is about the scientific equivalent of: *Have you read a work of Shakespeare's?* I now believe that if I had

> asked an even simpler question – such as, What do you mean by mass, or acceleration, which is the scientific equivalent of saying, *Can you read?* – not more than one in ten of the highly educated would have felt that I was speaking the same language. So the great edifice of modern physics goes up, and the majority of the cleverest people in the western world have about as much insight into it as their neolithic ancestors would have had (Snow, 1959, p. 16, italics in the original).

## Wilson and the meaning of human existence

You will note from my commentary that, even though he was deeply concerned with the concept of "consilience", Snow (1959) was in fact unaware of the term. It took another forty years for the word to re-surface in a context other than a series of well-hidden debates by philosophers of science. In a journal article and a highly readable book, Wilson (1998, 1999) re-introduced the term "consilience" and presented a carefully crafted argument for the concept in a valiant attempt to close Snow's (1959) culture gap between the humanities and the sciences, or what had now grown to the humanities, the social sciences, and the natural sciences.

Edward Osborne Wilson (born 1929) is a world-renowned myrmecologist (Hölldobler & Wilson, 1990), the father of sociobiology (Wilson, 1975), and a philosopher and theorist, best reflected in his writings on consilience. His most extensive argument for consilience is developed in his book *Consilience: the unity of knowledge* (Wilson, 1999), first published in 1998. The time-poor reader may prefer to read the journal articles Wilson (1998), titled "Consilience among the great branches of learning", and Wilson (2001), titled "How to unify knowledge", both of which essentially are abridged versions of Wilson (1999). However, I do recommend the extra effort of reading the book, which will be well-rewarded by the enjoyment of the rich use of language, the smooth flow of text, and the wonderful examples chosen to illustrate the concept of consilience.

The central theme of Wilson (1999) proceeded in three key steps. First, he argued that, following the rise of the modern sciences and post-Bacon man (sic – my term), any sense of unity was eroded and lost through increasing specialization of knowledge and growing fragmentation of fields of knowledge. Nevertheless, the social sciences, the humanities, and the natural sciences do have a common understanding, "a belief in the unity of the sciences – a conviction, far deeper than a mere working proposition, that the world is orderly and can be explained by a small number of natural laws" (Wilson, 1999, pp. 4f.).

Second, Wilson (1999) acknowledged the legacy of Whewell. To be fair, it should be noted that, whereas Whewell was carefully showing that findings and generalizations related to one phenomenon usually could explain other phenomena as well, Wilson presented a far broader conception of consilience.

> The greatest enterprise of the mind has always been and always will be the attempted linkage of the sciences and humanities. The ongoing fragmentation of knowledge and resulting chaos in philosophy are not reflections of the real world but artifacts of scholarship. … Consilience is the key to unification (Wilson, 1999, p. 8).

Third, Wilson (1999) acknowledged and responded to the work of Snow, continuing and justifying the bridging of the gap between the various disciplines:

> A fixed belief in the independent nature of culture has contributed to the isolation of the social sciences and humanities from the natural sciences throughout modern

> history. … Now there is reason to believe that the difference is not a true epistemological discontinuity, not a divide between two kinds of reality, but something far less forbidding and yet much more interesting. The boundary between the two cultures is instead a vast, unexplored terrain of phenomena awaiting entry from both sides (Wilson, 1999, p. 141).

Wilson's program of bridging the culture gap has continued, with a recent publication *The meaning of human existence* containing an extended discussion of consilience, without even mentioning the term (Wilson, 2014, pp. 35–75). Instead, we now read of "The unity of knowledge", in beautifully written essays on the "new enlightenment", on the all-importance of the humanities (remembering that he is a scientist), and on the driving force of social evolution, in which the arguments are a model of consilience. His conclusion is that, to solve the deep problems facing humanity (i.e. the destruction of our planet), a union of the humanities and the sciences, providing a more profound conception of history that is inclusive of biology and culture, is imperative.

## Concluding remarks

Others, too, have adopted the mantra of consilience. For example, Tietenberg (2011) sang the praises of consilience. Again, Slingerland and Collard (2012) presented a series of case studies in which the consilience approach has been implemented. Their illustrations of creating consilience addressed general theoretical issues that arise from the notion of consilience, in particular the way in which we conceive of humanity, and how "human-level realities can and should be studied against a background assumption of physicalist monism" (Slingerland & Collard, 2012, Introduction, p. 5).

Certainly, in the field of gifted education, "the era of the lone genius [if it ever existed] and silo-bound insularity is ending so the pinnacle is inaccessible to the individual genius" (Wilson, 1999, p. 11). Ambrose's call for reform aims at the consilience, in scholarship and teaching, of the natural sciences, the social sciences, and the humanities, with illustrations drawn from many disciplines. Any apparent difference between the natural sciences, the social sciences, and the humanities is in the magnitude of the problem, not the principles needed for its solution. "The two frontiers are the same" (Wilson, 1999, p. 293).

Hence, gifted education is most likely to survive as a discipline if it can be connected and proved consistent with other disciplines from each of the natural sciences, the social sciences, and the humanities. Rather than being subsumed by the other disciplines, such a consilience would in fact be liberating for gifted education. As Wilson states:

> The search for consilience might seem at first to imprison creativity. The opposite is true. A united system of knowledge is the surest means of identifying the still unexplored domains of reality. It provides a clear map of what is known, and it frames the most productive questions for future inquiry (Wilson, 1999, p. 326).

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**Commentary (4):**

# Nurturing Interdisciplinary Interconnections to Enhance Theoretical Talent Development: Using Metaphor to Reflect on Ambrose's Insights for Gifted Education

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## Abstract
In 'Borrowing insights from other disciplines to strengthen the conceptual foundations for gifted education', Ambrose takes an innovative approach to analysing interdisciplinary explorations in Gifted Education research and he raises some very pertinent issues. The innumerable contradictory findings, contrasting beliefs, and varied theories in Gifted Education reinforce the diversity of the field. Yet, there is ongoing criticism of research in Gifted Education that it tends to lack cohesiveness, driving investigators to synthesize literature from multiple sources and cross disciplines to answer some of the simplest questions. The fact that academics are 'borrowing' more from other disciplines however, suggests that there is no need to 'reinvent the wheel' within our own discipline! Ambrose reinforces that we shouldn't be reinventing the wheel so much as amending old ones, old concepts, theories, strategies, processes, and exploring new ideas, based on the ingenuity of colleagues in other disciplines who may have pioneered new theories or explored similar conceptions, but in more ingenious ways. Taking into consideration the above contrasting perspectives, this reflection will review a few key issues raised in Ambrose's target paper that are relevant to our philosophical view, our research, and our practice. We will respond to the possibilities of interdisciplinary scholarship indicated by Ambrose by using the metaphor of '*theoretical* talent development'.

**Keywords:** Interdisciplinary; giftedness; theoretical talent; holistic research & practice; wisdom-based; complexity; dynamic; ecological system; metaphor.

Whole universities have been restructured around promoting interdisciplinary research (Razzaq, Townsend, & Pisapia, 2013). However, there is conflict between focusing research within one discipline for the benefit of the field and being more innovative, by taking risks in exploring what interdisciplinary research has to offer (Razzaq et al., 2013). In his paper, Ambrose (2015) takes an innovative approach to analysing the benefits and deficits of interdisciplinary explorations of Gifted Education research. He raises some very pertinent questions to guide the enhancement of the conceptual framework of gifted education that are strongly supported by interdisciplinary research and by his myriad interdisciplinary publications in particular. The innumerable theories, definitions, conceptions, models, investigative methodologies, contradictory findings, and contrasting beliefs in Gifted Education reinforce the diverse nature of the field. And yet, others have reported that an

ongoing criticism of research in Gifted Education is that it tends to lack cohesiveness, coercing investigators into synthesizing literature from multiple sources and from across disciplines to answer the simplest questions, such as the definition of giftedness, rather than building on the work of each other (Flint & Ritchotte, 2012; Makel, Snyder, Thomas, Malone, & Putallaz, 2015). And yet, the fact that academics in Gifted Education are 'borrowing' more from disciplines outside their field, suggests that there is no need to 'reinvent the wheel' within our own discipline, but 'mend old fences' in and beyond the field! Ambrose reinforces that we shouldn't be reinventing the wheel so much as amending old ones, old concepts, theories, strategies, processes, and exploring new ones, based on the expertise, experience, inventiveness, and ingenuity of colleagues in other disciplines who may have pioneered new theories or explored similar conceptions, educational contexts, processes, but in new and ingenious ways.

"When does an academic field of study become worthy of being described as rich, valuable, or important?" Cross (in Robinson & Jolly, 2013) affirmed that Gifted Education is a valuable field. Based on a century of foundations, Ambrose calls for borrowing insights from other disciplines to strengthen our conceptual foundation of Gifted Education. For responding to the possibilities, benefits, and pitfalls of the interdisciplinary scholarship as Ambrose indicates clearly in the target paper, we implement the metaphor of '*theoretical* talent development' to discuss how interdisciplinary scholarship will enhance the theoretical talent of Gifted Education in humanities research.

Focused on Ambrose's recommendations for expanding and strengthening interdisciplinary work in Gifted Education and based on the Vygotskian (1978) perspective, Ambrose's paper has encouraged us to reflect on our philosophy, research, and practice. As such, we will supplement Ambrose's view by delineating the metaphor of '*theoretical* talent development' in three ways: 1) recognizing the unique *'*theoretical*'* talent of the field of Gifted Education in the landscape of humanities research over the last century more clearly; 2) strengthening the theoretical talent of the field of Gifted Education by borrowing interdisciplinary scholarship and insights more smartly; and finally, 3) proposing a wisdom-based but complex adaptive system to enhance the field of Gifted Education through interdisciplinary collaborations.

## 1. Recognizing unique theoretical talent in humanities research over the last century more clearly

### *1.1 The field and the fence of the conceptual foundation of Gifted Education*

We visualise the field of Gifted Education surrounded by a protective fence with enlightened corner stakes, much like an enveloped farmer's field. The conceptual foundation of Gifted Education would not be illuminated by researchers without the 'fence' of the field. Galton (1869) pegged the first 'stake' as *Genius* in the fence of the field of Gifted Education. A follower of Galton, Terman (1925) pegged the second stake as *Giftedness* with *intelligence,* while Torrance (1962) pegged the third stake as *Creativity*. Sternberg (2003) pegged the fourth stake as *Wisdom* in the model of 'Wisdom, Intelligence, and Creativity Synthesized' (WICS). These important diverse but interconnected stakes and others honored in Robinson and Jolly's (2013) review have helped to create the border fence of the field of Gifted Education. With the fence, we are able to cultivate the field in a more efficient way around 'what' nurtures and 'how' we nurture individual differences, especially high intellectual performance: *Giftedness, Greatness (eminence) and Genius*. The field of Gifted

Education has been consistently nurtured by theorists, specialists, parents, the gifted, and practitioners alike, and, the fence of the field has been expanded exponentially and rebuilt depending on these and many other individual's contributions. For example, Gagné (1985, 1993, 2010) identified the twin to *giftedness*, by elaborating *Talent* in his Differentiated Model of Giftedness and Talented (DMGT). It is not just each individual's contributions however, but the influence of the interrelationships between these advocates and their findings that enrich the field.

### *1.2 The dynamic evolution of the conceptual foundation of the field of Gifted Education*

Over the past century, the conceptual foundation of Gifted Education has evolved due to the diverse contributions of researchers in the field. Van Tassel-Baska (1998) and Renzulli (2002) summarized that the conceptual foundation of Gifted Education has moved from a conservative perspective towards a more liberal view of giftedness. According to their reviews, we can see the dynamic evolution of the field of Gifted Education and we analogise this evolution as the fine root, the developing stem, the embryo branches, and reframing the interconnected fence:

**The fine root.** The notion of Galton's *Genius* has been differentiated into the concepts of *Giftedness and Talent* (Feldhusen, 1996; Gagné, 2010; Van Tassel-Baska, 1998). While intelligence and giftedness are considered different constructs (Makel et al., 2015), the concept of giftedness has expanded to embrace intelligence and creativity (Guillford, 1950; Torrance, 1962). The idea of intelligence has evolved from a unitary concept into componential (Sternberg, 1985) and multiple intelligences (Gardner, 1983). With expansion further in the micro level, Simonton (2005) has proposed an emergenic-epigenetic model for addressing the interrelationship between *Giftedness* and Genetics. While debate on these concepts continues the interrelationships between them have been explored and provide the foundation of contemporary conceptions of giftedness (Makel et al., 2015).

**The developing stem.** While the micro-level structure of giftedness has evolved, Gagné's DMGT (1985, 2010), Renzulli's three ringed conception of giftedness (1994, 2002), and Sternberg's WICS (2003) proposed their macro-structure of giftedness from the ecological viewpoint, though they progressed in different directions. Recognizing the dynamic interaction of nature and nurture in the development of high ability, Renzulli, Gagné, and Sternberg provide dynamic, developmental views of giftedness, in line with other recent researchers' perspectives (Subotnik, Olszewski- Kubilius, & Worrell, 2011).

**The embryo branches.** While these theoretically talented scholars have worked diligently in the field of Gifted Education, several adventurers have crossed the field's borderlines to integrate insights from diverse disciplines, for example: much of Ambrose's (2003, 2005, 2009, 2012, 2015) work; the neuro-cognitive foundation of different areas of giftedness (Kalbfleisch & Gillmarten, 2013; Leikin, Waisman, & Leikin, 2013; Mrazik & Dombrowski, 2010); extensions of sociological theories on high ability (Smith, 2014); and the anthropology of the gifted disadvantaged (Shoshana, 2007). Some of these branches may grow into main stems and some may fade with the wind if we do not nurture their interdisciplinary approach.

**Reframing the interconnected fence.** Most recently, Borland (2005, p. 1) has tried to amend or eliminate the fence of the field with his view that there should be no 'gifted' education evinced in his statement of 'Gifted education without gifted children: The case for

no conception of giftedness'. He argues that the notion of "the concept of gifted child is a social construct of questionable validity (Borland, 2012, p.106)" and grounded in utilitarianism and pragmatism, "the educational practice predicated on the belief in the existence of the gifted child has been largely ineffective" (p.107). Borland then proposes that "the construct of the gifted child is not necessary for, perhaps is a barrier to, achieving the goals that brought this field into existence in the first place" (p.107). Similarly to Gould's (1981) contribution to the field of intelligence, Borland's perspective aims to reframe our view of the field.

With the growing understandings of the complexity of the nature of ability, the diversity of giftedness, and the dynamics of *greatness* or eminence the concept of giftedness oscillates back and forth between nature as aptitude to the other extremity that is contextualized as wisdom. With the understanding of the complex interrelationship of the nature and nurture of giftedness, research has moved the focus from gifted individuals to gifted students, then to gifted learners and gifted behavior, so aspects of the conception of giftedness tend to be more confluent now.

The unique theoretical talent developed in the field does not evolve alone. Gifted Education is not an isolated island from the landscape of humanities research; it relies on the network of community and its linkages within humanities research. The evolution has grown exponentially, quietly, implicitly, and explicitly through the diverse scope of researchers' expertise, interests, and backgrounds even though heightened awareness of researchers crossing the borderline into other disciplines has increased. There are collegial benefits for collaborative researchers to cross disciplines. For example, Ambrose (2009, 2012, 2015) describes how his works involve explicit collaboration with other fields, while Gardner's (1983) and Winner's (2000) view of intelligence and giftedness benefited from Project Zero (Seidel, Tishman, Winner, Hetland, & Palmer, 2009) which also involved collaborations with the artistic disciplines influenced by experiences with the Chinese culture more implicitly.

"When the field of application for [researchers'] theories expands, they gain a more holistic view of the problem under investigation and complex problems come under scrutiny from multiple angles for both problem-solving and innovation" (Razzaq et al., 2013, p. 152). As good researchers, we are the gatekeepers who are aware of the foundation stakes in the field's fence, cognizant of ways to rebuild the fence itself by addressing the gaps in research, and we seek valuable community and collegial connections. In essence, we will rely on the stakes and the fence, but open the gate to further explorations in order to nurture the field using more interdisciplinary research, dynamically and holistically.

### *1.3 The quiet revolution of giftedness based on the understanding of and education of human potential*

Within humanities research, the unique theoretical talent of researchers in Gifted Education has resulted in a quiet revolution. This revolution has helped to develop a deeper understanding and education of human potential, from both positive and negative perspectives. More dynamic research and practice have emerged.

**Diverse differences leading to the dynamics of education.** Due to the diversity in student populations, Tomlinson and Callahan (1992) called for Gifted Education to provide a leading role for positive change in education overall. In the last two decades, we have seen much gifted research leading changes to general education practice globally to address

student diversity (Hockett, 2009). Theorists in the field of Gifted Education have expanded views of ability (Gagné, 2010), attended to underserved populations (Vialle & Rogers, 2012), elaborated differentiated curriculum and pedagogy (Tomlinson & McTighe, 2006), provided a dynamic ecological view of Gifted Education (Smith, 2015a, 2015b), and introduced numerous curriculum and pedagogic models (Maker & Schiever, 2005, 2010) to name a few.

**The over-simplified myth of support for potential development.** There is the view that 'Gifted Education' has addressed the potential needs of gifted students, however, practitioners, supported by theorists, still seem to assess gifted students' potential while sacrificing the dynamic nature of their potential development (Scheffler, 1985). Scheffler (1985) points out that the three myths of: 'fixed' potential, 'harmonious' potential, and 'valuable' potential, reduced the 'problem' of education to questions like "what potential does the student have?" and "how is this potential most efficiently to be realized? (p. 14)" The main function of Gifted Education has been reduced to finding student potential and then realizing this immediately. Just identifying the potential of students and providing one immediate 'provision' is not sufficient to recognise giftedness and support talent development. For example, a youth may desire two career paths but may only have the potential to achieve in one, and:

> realizing the one we value has the effect of precluding the other that we do not appreciate. If one is to be preferred to the other, there must be a judgment embodying such preference. And such judgment will reflect the relative values ascribed to conflicting realizations. (Scheffler, 1985, p. 15)

**Realisation of potential takes time and support.** In the education of the gifted the field faces challenges regarding which type of giftedness to include or exclude or which talents to develop or the field can focus on individual potential and explore the intricacies of the supports needed to develop talent (Smith, 2015a). Every gifted student possesses potential that can be realized within the developmental process, but there are attitudes, misconceptions, conflicts, lack of differentiation, chance factors, limited acceleration opportunities, and contradictions along the path to talent development. Additionally, identification and provisions might be limited and flawed due to the absence of understandings of socio-cultural influences (Makel et al., 2015).

**Exploring potentialities.** Ambrose highlights that in a time of change in the 21st century, the gifted field has boundless grounds for exploration. There are definitely several issues that need addressing, and some are:

- The relationships between brain, mind, and culture in the concept of giftedness;
- Using high ability to integrate complex concepts to overcome uncertainties;
- Using new perspectives and methodologies to assist the understanding of the dichotomy between research limitations and unlimited human potential;
- Reducing underachievement, supporting the underserved, resourcing the disadvantaged, and providing holistic educational opportunities for all; and
- Preparing the gifted to address global issues in the 21st century through eLearning, ICTs, and building socio-cultural interrelationships.

As a unique field, we have to set the fence so that we know the boundaries. Defining the most relevant issues allows us to identify the tools and allocate our efforts to cultivating the field of Gifted Education without overloading the academic researcher at the expense of progress. Researchers respect their own field, never want to tear down their field's fence, and should allow Gifted Education to develop unique theoretical talents within the field. Talented

researchers, however, reframe the fence as necessary by respecting and embracing cross-disciplinary diversity, in line with Ambrose's thoughts.

The field's border fence may be a constraint, but it can be expanded, crossed, or diversified, and many theoretically gifted scholars have already done so, as discussed in Ambrose's paper. Notably, Geertz (2000) would not have broken through the boundaries of the anthropology field and his inquiries would not be so unique if there was no fence at all. He relies on specific pursuits in the anthropology field and others' insights in the gifted field to make relevant judgments for his inquiries. The problem we face is how we identify the merits and the pitfalls of the centrifugal impulse and the centralized distillation in order to see the nuanced potential of the field, as Ambrose alludes.

## 2. Strengthening theoretical talent of Gifted Education by borrowing insights from other fields more smartly

The Gifted Education field is rife with conflicting perspectives, varying agendas, differing philosophical stances, and diverse models on conceptions of giftedness, identification, assessment, teaching, instructional methods, and learning processes (Ambrose, VanTassel-Baska, Coleman, & Cross, 2010; Ericsson, Roring, & Nandagopal, 2007; Makel et al., 2015). Such diversity suggests the need to explore ways to reach consensus or to explore synergies and interrelatedness. Instead of competing to try to identify universal 'models', why not acknowledge that the diversity in models reflects the diversity in human nature, the flexibility and dynamicity of the nature of education and responses in learning. And, as such, choose those ideologies or models that fit the culture, the community, the school, or the family that most addresses the individual needs of the child or student? Perhaps the focus needs to be on addressing the individual needs of all students, inclusive of gifted students, rather than trying to synthesize, coalesce, or integrate the mindfield of contrasting research findings and definitions in endeavors to identify 'which is best' when 'best fit' within a socio-cultural context is all that is needed (Persson, 2012). Why reinvent the wheel within our own field, when there are plenty of research-based practices, theoretical frameworks, and models within and beyond the field to use as a basis for supporting gifted children's talent development already?

A good farmer not only works hard, but also works smartly. Smart researchers learn from experience and by looking at the 'talent' developed in their fields, by observing the talents in other fields, and by enriching and cultivating their own fields consistently. Borrowing insights from other fields is not automatically achievable. The culture of every field is so unique that it takes considerable expertise to examine and identify synergies across fields (Bourdieu & Wacquant, 1992; Snow, 1959). As Ambrose mentioned, it takes extensive work to excel in the culture of a specific field; so, to be sufficiently knowledgeable in multiple fields is exceedingly difficult. Concerning strengths and flaws, Ambrose urges researchers in the field to strengthen our theoretical talents more smartly by borrowing the insights of other fields without watering down theoretical talent in our own field. Smart researchers are aware of their talents and limitations, and refine their insights based on their compatibility within their specific inquiries and keep open-minded for the possibilities of integrating ideas from elsewhere (Razzaq et al., 2013; Ambrose, 2009, 2012, 2015).

### *2.1 Enhancing and cultivating theoretical talent in the field of Gifted Education*

Based on a century of contributions to high ability Gifted Education has made to research and education, Ambrose points out clearly in the target paper that "we need

international, interdisciplinary collaboration to address some big questions, such as the extent to which we are preparing the gifted life in the complex, globalized 21st century" and addressing important issues and phenomena. Theoretical talent in Gifted Education will grow sturdily and vigorously if we borrow insights from other fields smartly. Such 'borrowing', as Ambrose suggests, can enable us to explore concerning questions using the diverse research available to us across disciplines. However, he also asks, "to what extent do cognitively diverse teams of experts in our field come together to share diverse problem-solving heuristics . . . , theoretical perspectives, and belief systems . . . ?"

**Refining the root of the hidden dimensions of high ability using the insights of diverse fields.** Neuroscience is an evolving research area that suggests that talent can be explained by the role of myelin's influence on nerve fibres in the brain (Coyle, 2009; Kalbfleisch & Gillmarten, 2013). Further expanding the knowledge base on implicit learning (Reber, 1989), embodies cognition (Lakoff & Johnson, 1999), mindfulness, and neuroplasticity (Lazar, Kerr, Wasserman, et. al., 2005) in the field of cognitive science, and provides us with valuable information on the hidden dimensions and complexity of the nuances of high ability and intelligence. The increasing knowledge on the ornamented worlds (e.g. Valsnier, 2008) in the field of cultural psychology and anthropology (Geertz, 2000) also provides us with another framework to investigate how to design the texture of contexts to illuminate the high ability of children.

**Consolidating the structure of the stems with the metaphors of diverse fields.** The two different research directions taken by Gagné (1985, 1993) and Sternberg (1985, 2003) are not two conflicting views. Instead, the two form a solid stem for others to grow diverse branches of theory in between. Ancient philosopher Taiji's metaphor of a theory of complexity in Chinese culture (in Dainian, 2002) suggests that we may integrate the two into a holistic pattern for Gifted Education. Hence, ability or performance or talent growth are supported by intricate patterns of the interweaving of nature and nurture combined. There is some nurture within the nature and some nature within nurture. In some cases, giftedness is so obviously seen as natural ability, such as with prodigies or twice-exceptional children, while giftedness in others may be revealed more slowly as their expertise evolves. A smart farmer never compares or chooses nature over nurture, from the extreme ends of the continuum of life, but gains knowledge from the dynamic interrelationships between the two. Borrowing the metaphor of 'silent transformation' Jullien (2011) generated in the philosophy field, we may gain a more flexible model of understanding the transformations of giftedness, talent, and expertise, and elucidate more insightful perspectives from which to consider the relationship between nature and nurture in the course of change. However, the stem will wither if there are no branches or leaves growing with it. Hence, without branching interrelationships there will be no diversity, no collaboration, no recognition of the strength in interrelationships, and the benefits of interdisciplinary research.

**Restructuring the fence with synthesized analyses that borrow insights from diverse disciplines.** The more complex the research problem to be solved the greater the need for engaging other disciplines more holistically (Razzaq et al., 2013). Aligning with Ambrose, Razzaq et al. (2013) reinforces the need for interdisciplinary collaborative research through the systematic integrated synthesis of ideas, problem solving, and pluralistic methods that produce genuine and holistic research interrelationships for innovative, comprehensive, and sustainable outcomes. As Ambrose points out, there are several works that borrow

insights from diverse fields and most of their results indicate that restructuring the fence of the field of Gifted Education is needed (e.g., Subotnik et al., 2011).

Persson (2012) borrowed and integrated concepts from multiple disciplines and concluded that Gifted Education is dominated by American cultural influences. Dai and Chen (2013) restructured the field of Gifted Education into three paradigms: the 'gifted child', 'talent development', and 'differentiation'; and elaborated the continuities and discontinuities of the three paradigms. They suggested that the articulation of the paradigm properties may make the relevance and significance of a particular line of research clearer to the community of Gifted Education practitioners. Latz and Adams (2011) indicated that in borrowing insights from other fields we gain more understandings about the field by re-analysing existing research and suggesting new questions for empirical research. Is borrowing insights from other fields needed to integrate the most important issues that might have been overlooked or misconceived in the last century? Is it necessary to investigate 'what' we choose not to pay attention to and why? As Ambrose proffers as a scientific illusion, we tend to align research results coherent with recognised research and researchers and exclude new but conflicting evidence or non-significant results in our publications. However, it is usually the conflicting evidence that assists us to renew, enrich, or restructure an area of research or the field itself. Nevertheless, it takes time, new ideas, and new tools for such restructuring to occur. For example, Gould's (1981) research on neurogenesis and hippocampal function brought Altman's and Kaplan's views back to the field of neuroscience.

### *2.2 Striving for stronger philosophical foundations by examining the misconceptions of the field through epistemological pluralism to transform the field*

**Out of Aristotle's box of potential?** Scheffler (1985) points out that the idea of permanent nature with an enduring essence is residue from the Aristotelian metaphysic of essences defining natural kinds. The 'essence' of the kind defines the natural end of its members and explains their development as progressive actualizations of their ideal form. In the language of giftedness in education, we refer to giftedness as the 'essence' of possible future high learning or talent development or the evolvement of specific exceptional features, greatness or eminence. As Scheffler (1985) suggests, "human action is neither physical movement nor biological development or response alone, but is rather symbolic in character, is a basic fact from which far-reaching consequences flow" (p.17-18). How could we think outside Aristotle's box and re-conceptualize the idea of giftedness? Without the concept of intelligence or creativity, what counts as the essence of possible future learning? Vygotsky's (1978) social constructivism is the socio-cultural epistemological stance proffered here, that reinforces supportive interrelationships to enhance potential, giftedness, creativity, and intelligence for talent development.

**Philosophical view from the discourses or metaphors of genius in diverse fields.** As Ambrose highlighted, metaphor is essential for establishing the common conceptual ground for interdisciplinary understanding and communication. Groundbreaking theorists or geniuses in diverse fields tend to use simple metaphors, analogies, graphic organisers, or themes to communicate very complex ideas. This happens in the field of physics especially. The worldview shifts when the metaphor changes. Definitions of problems and technologies change as well. For example, Lehrer (2008) used literature to describe how artists discovered

the truth of the human mind, real, tangible truths that science is just now discovering. Are we finally realising intellectual giftedness that exists in the diverse creative arts?

**Philosophy of human nature from the perspective of diverse cultures.** Maslow (1968) stated that when our philosophy:

> changes, then everything changes, not only the philosophy of politics, of economics, of ethics and values, of interpersonal relations, and of history itself, but also the philosophy of education, of psychotherapy, and of personal growth, the theory of how to help men [and women] become what they can and deeply need to become. (p. 189)

The theoretical potential of the field in Gifted Education depends mainly on what we believe and are expected to become. As Ambrose explains, the field of Gifted Education is grounded in the western cultural landscape, originating mostly from the USA. From the Chinese cultural perspective, there is a different philosophical view regarding the nature of the human being, and there is a different expectation of how good a man or woman should become. As Yen and Lu (in Hsu & Wu, 2015) suggest, without a religious overtone, there is a strong tendency to reflect on human nature and the actualization of human nature philosophically in Chinese tradition rather than in Western culture. Bruner (1996) said that:

> understanding in any one particular way is only right or wrong from the particular perspective in terms of which it is pursued. But the rightness of particular interpretations while dependent on perspective, also reflects rules of evidence, consistency, and coherence. (p. 13-14)

A perspectival view of meaning making does not preclude the other, instead the different perspectives shine and reflect each other mutually. In the field of developmental psychology, Sameroff (2009) proposes a transactional model of development based on cross-cultural understandings of development. What would a model of giftedness look like if implemented according to the transactional view rather than interactional view between nature and nurture, or between East and West? After reviewing the evolution of the construction of giftedness, Borland (2004) asserts that giftedness is not a fact of nature, instead, it is a socio-culturally constructed concept. With interdisciplinary scholarship, it seems that we come closer to what Borland (2004) asserts. What are the philosophical foundations of the field and the value of Gifted Education without the 'essence' view of giftedness? Would it lead to more effective Gifted Education, but fewer gifted programs as Borland (2004) suggests?

### *2.3 Integrating the conceptual foundation of giftedness into the complexity of practice*

Ambrose reiterates that "gifted education is concerned mostly with curriculum, instruction, and counseling" at the "practical ground level", where "fine-grained curriculum planning, differentiation, and other aspects of school-based work become visible". However, moving up to the broader practical level, the links between the theoretical and philosophical levels become blurred. To avoid scientific illusion and dogmatic escape from reality on the one hand and to preclude lamenting the atheoretical or aphilosophical inquiry at the other hand, may we see the three, practice, theory, and philosophy, as one holistic, interconnected level?

**A holistic view of the complexity of high ability.** The more we understand the complexity of practice, the more we tend to differentiate for individual differences with more strategies and toolkits. Every teaching toolkit and strategy differs in its specific function. At the end of every teacher professional development workshop, every teaching toolkit, and

every exploration of theoretical foundations for best practice, there is a reminder: *Every child is unique.* How many categories do we need to add to illustrate individual student differences and how many toolkits do we need to create to address the increasing complexity of individual difference in the classroom today? The more teachers learn about individual differences, the more they tend to place children's abilities into fragmented categories. The sum of cognitive and socio-affective needs is not equal to the wholeness of the child. As Tagore (cited in Scott, 2009) said, "by plucking her petals, you do not gather the beauty of the flower". When we call for the education of the whole child, how can we see high ability holistically rather than as a list of labels or categories that amalgamate different characteristics of the child?

The complexity of human nature is not logically structured nor ordered (Morin, 2000; Scheffler, 1985). We are potentially evil as well as good, intelligent or not, reasonable or irrational. Every individual is a small universe within, and to see the complexity of each little universe, we could implement the view from the paradigm of Newtonian and Quantum theory. With the insight of physics, Bohm (2002) calls for a holistic view of the world and emphasizes "understanding the nature of reality in general and of consciousness in particular as a coherent whole, which is never static or complete, but which is in an unending process of movement and unfoldment" (Bohm, p. x).

Theoretically, implementing Bohm's (2002) insight of rhemode (flow mode) and working with a more holistic view of high ability of children in the field of Gifted Education, could include everything coherently and harmoniously in an overall, undivided whole without borders, and from this would flow a more orderly action within the whole. Pragmatically, integrated models to support the talent development of the whole child have been developed and utilized (e.g. Clark, 1992; Maker & Schiever, 2010; VanTassel-Baska, 2012), while Smith (2009, 2015a, 2015b) devised the Model of Dynamic Differentiation (MoDD) to reinforce the complex, dynamic, and holistic interplay between all aspects of education of all students, including gifted students.

**The practical theory of Gifted Education.** Over a century ago, Dewey (1904) indicated the evil of the dualism between theory and practice in education,

> the unconscious duplicity, which is one of the chief evils of the teaching profession. There is an enthusiastic devotion to certain principles of lofty theory in the abstract — principles of self-activity, self-control, intellectual, and moral — and there is school practice taking little heed of the official pedagogic creed. Theory and practice do not grow together out of and into the teacher's personal experience. (p. 15)

The dilemma of the relationship between theory and practice is still a critical issue for educational theory. Could we establish a theory of Gifted Education that grows together out of and into children's and teachers' experiences? Gadamer (1979) suggested that "humans are not blindly obedient to the prescriptions of a society" (cited in Hsu & Wu, p. 59). People always seek the best and the good in their decisions. Gadamer's (1979, n p) "emphasis on application in understanding already implies that all understanding has a practical orientation". Scheffler (1985) indicates that knowledge of processes within professions, such as medicine, engineering, and education, is gleaned from different scientific disciplines. Due to these interdisciplinary links that inform professional practice, he proposed a conceptual framework of practical theory of 'potential development' including: "capacity to become", "propensity to become", and "capability to become". This framework may be a cornerstone

for establishing the practical theory of Gifted Education. There are several successful projects in the field of Gifted Education, such as Project Zero (2009) and Project2Excel (Rogers, 2011) based on this theoretical foundation. Some possibilities of practical theory might be merged by re-analysing and restructuring the conceptual framework of existing or on-going projects.

Pragmatically, practitioners as researchers help make the links between theory and practice. Smith (2009, 2015a, 2015b) proposes the MoDD that is founded on her educational experience and decades of theoretical explorations across education, psychology, and science and has an ecological systems approach. The model reinforces the need to move provisions for gifted students towards provisions for individual student needs, from singular provision to ecological provisions, and from mechanistic to holistic pedagogy. With ecological systems research, we encourage the implementation of Gifted Education away from the paradigm of diverse differences leading to differentiation towards diverse differentiation leading to support for individual, holistic uniqueness; that, in turn supports an interrelated interdisciplinary approach. Notably, the MoDD emphasizes interdisciplinary problem solving, self-regulation, and collaboration, emulating theoretically talented adults and promoting future leaders and theorists.

## 3. Gifted Education: A wisdom-based complex adaptive system

Achieving solutions by borrowing insights from other fields is a complex, never-ending process of alchemy. While there are no enduring or easy tips, it does not happen randomly. Wise researchers never let their fields evolve into wild, abandoned ecosystems or over-managed unitary fields as controlled as science labs. As Ambrose suggests, "when the system locks into either excessive order or excessive chaos its behavior lacks productive complexity". One question is how complex or diverse do we need or want the field to be? How do we allow the Gifted Education field to maintain its unique and vigorous foundations yet evolve to become enriched by the discourse of other disciplines? We may consider enhancing the field of Gifted Education into a wisdom-based complex adaptive system by collaboratively borrowing insights from other fields. Three considerations for establishing the field of Gifted Education as a wisdom-based complex adaptive system include: values, dynamic understandings, and garden variety or theoretical talent.

**Values.** Concepts or theories are based on socio-cultural practice. Contemporary researchers reinforce the interrelationship between giftedness, the environment, and talent development (Gagné, 2010; Persson, 2012; Smith, 2015a). Kuo (1992) investigated a variety of important environmental factors that impact talent development. He concluded that too many values in a period of society exhausted a talented individual's energy and unitary values undervalue the system and inhibit talents. As a valuable field, Gifted Education continues to contribute unique theoretical talent to enhance the understanding of high ability within humanities research in harmony with other research, but without uniformity. How could we transform the value of the field and values within the field by borrowing insights from diverse fields?

**Dynamic understandings.** Interdisciplinary research is daunting, challenging, and dynamic, considering the complexities of human nature and the diversity and divisiveness within the field itself (Anchan, 2012; Makel et al., 2015). Interdisciplinary research, however, has been shown to be achievable, reinforces interrelationships between key issues, and has enriched the Gifted Education field. Ambrose (2009, 2012, 2015) has reinforced the benefits

of interdisciplinary research. We propose that we should be able to judge beforehand what is good research on interdisciplinary scholarship, or be able to establish a set of clear criteria for interdisciplinary studies in the field of gifted education. Just as the farmer learns from experience to sow the right crops at the right time for the best outcome, a wisdom-based system of understanding does not try to avoid making mistakes but tries to learn from mistakes. By borrowing insights from diverse fields, while understanding complexities and nuances of giftedness as a semi-open system of practical, theoretical, and philosophical movements nurtures the field vigorously and dynamically.

**Garden variety or theoretically talented?** The differences between researchers in the field of Gifted Education is analogous to the differences among gifted students. Everyone in the field needs different pathways for academic growth, and develop in different ways by harnessing the significant research within the field while also borrowing from others' research. In spite of the problems Ambrose mentioned, such as the "promotion and tenure requirements", "the language barriers" for inter-cultural, interdisciplinary communications, and that "eminent scholars from 'foreign' disciplines may be less than willing to participate in interdisciplinary collaboration", wise scholars are striving to learn from research and practice in their unique individual ways while also forging worthwhile interdisciplinary collaborations. Wise scholars who are willing to collaborate in and beyond the field of Gifted Education propose the critical issues that are most important to Gifted Education, to general education, and to humanity.

Many researchers in the field have called for changing paradigms in gifted education (Subotnik et al., 2011). However, the

> best paradigm can only really work if all the parts are integrated into the process and if the design itself is structured with a dynamic that has inherent flexibility, is responsive to change and refinement, and maintains acutely aware, balanced cultural sensitivity that stands firm against ethnocentricity and dominance (Persson, 2012, p. 49).

Theoretical evolution will progress wisely as long as we are grounded in the same field, and share the same goals clearly, smartly, flexibly, dynamically, and wisely. Such grounding however should encourage interdisciplinary collaborations, not hinder them. With tomorrow's cleverest theoretical talent striving toward innovative aspirations as Ambrose suggests, we should not be 'sitting on the fence', isolated in our own field, but staying longer with the most relevant problems and standing firmly on the shoulders of the theoretical frontiers of diverse disciplines, so that the field of Gifted Education will merge into a new paradigm.

There is a wide range of implications inferred from Ambrose's scholarly article, which is soundly researched, comprehensive, with thoughtful, engaging, and illuminating content and challenging questions to implore the reader to reflect more deeply on the issues raised. He uses his own expertise, experience, research, and publications as a foundation for his thought-provoking piece. While some of our work is cross disciplinary, the questions he asked, challenged us to view further options for interdisciplinary investigations with larger pools of collaborative researchers, regardless of the possible difficulties. From the dynamic ecological systems perspective research and teaching is dynamic, flexible, and creative with assessed, scaffolded, enriched, self-regulated, collaborative, and global differentiated learning and growth to ensure talent development for gifted students and theorists alike. This approach ensures exploration of the dynamic interrelationships between key elements within

the research process, interlinked with teaching and learning processes. Likewise, expanding research options across disciplinary arenas, utilizing diverse research methods, terminology, and processes already explored elsewhere inhibits recreating the wheel within the Gifted Education field, and opens the gates to reframing the theoretical fence with synthesized analyses that borrow insights from diverse disciplines and explores more creative research techniques in more depth. While research within the field is invaluable, taking an interdisciplinary approach to research, as Ambrose has done, and incorporating a wisdom-based complex adaptive system could nurture theoretical talent and enrich the future field of Gifted Education theoretically and pragmatically.

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**Commentary (5):**

# Borrowing Insights from MIT and Otto Sharmer as a Conceptual Base for Gifted Education

**Dorothy A. Sisk**
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In an effort to strive for epistemological pluralism as suggested by Donald Ambrose in his thought provoking article *Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundations for Gifted Education*, an exploration of the diverse ideas and problem-solving approaches of Otto Scharmer from the Massachusetts Institute of Technology (MIT) will be examined and ways Scharmer's Theory U can serve as a conceptual base with gifted programming. At Lamar University in Beaumont, Texas, Theory U is used as a theoretical and conceptual base for instruction in the Texas Governor's School (TGS) for high ability and high achieving students, and this application will be discussed. In addition, this article will respond to the Ambrose recommendation of being aware of the benefits of both narrow and broad interdisciplinary work. A broad interdisciplinary approach is used between the disciplines of Science and Humanities at Lamar University resulting in significant "border crossing" of the disciplines. As the gifted TGS students explore the theme of *energy production* and *sustainability* in the two different disciplines, they develop awareness of the importance of different forms of energy, including psychic energy as suggested by Jung (l969), and energy production and sustainability. A metaphor used in the Texas Governor's Program to facilitate greater border crossing is the *Cage* in which the bars of the *Cage* represent aspects of the individual. This article will provide a brief summary of Theory U; Application of Theory U to the Texas Governor's School using the theme of *Energy Production, Conservation* and *Sustainability*; the Use of Metaphor; and benefits of interdisciplinary work.

## Theory U summary

Otto Sharmer, Peter Senge, Joseph Jaworski and Betty Sue Flowers worked together to conceptualize a theory about change and problem solving which led to the book *Presence: Human Purpose and the Field of the Future* (2004). The four of them engaged in probing conversations over a year and half, talking with numerous leaders about how profound transformational change occurs. In over l50 interviews, they identified a core capacity needed to access the field of the future which they called *presence*. *Presence* was defined as deep listening, of being open beyond one's perception and traditional ways of making sense. They described it as *letting go* of old identities and the need to control. In the introduction of their book *Presence*, they said, "Ultimately we came to see all the aspects of presence as leading to a state of "letting come" of consciously participating in a larger field of change. When this happens, the field shifts and the forces shaping a situation can move from re-creating the past to manifesting or realizing an emerging future" (Senge, Scharmer, Jaworski & Flowers, 2004, p. 14).

Theory U is a social change model (SCM) and Wagner (2006) described it as relational, transformative, process-oriented, learned and change-directed. SCM is based on principles of being purposeful and collaborative, resulting in positive change. In the SCM, social responsibility and change for the good involve the use of eight core values targeted toward enhancing the level of self-awareness of individuals and their ability to work with others. The eight values are grouped into three areas: Individual, group and society, and community. The individual values include: Congruence, consciousness of self and commitment. The group values include: Collaboration, common purpose, controversy with civility and the society/community values include citizenship. The SCM model is depicted in Figure l:

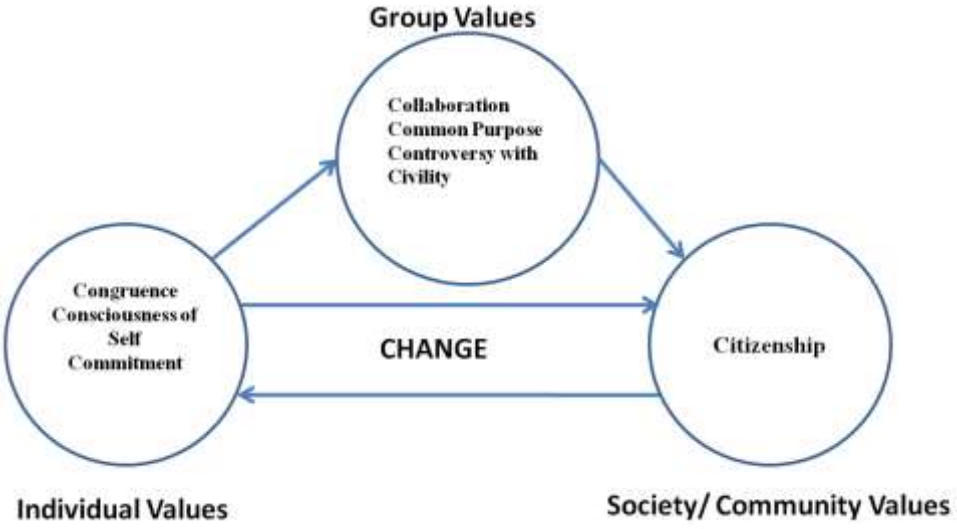


**Figure 1:** Social Change Model

**Application of the eight core values of Theory U with the Texas governor's school for high ability and high achieving students**

## Individual values

**Consciousness of Self.** One effective activity to build a consciousness of self with the Texas Governor's School (TGS) students in 2014 was the Cage Painting Simulation, Rimmington and Alagic (2008). The metaphor of the cage represents the perspective of the individual student and the cage bars represent characteristics and details of the life of the student including: (CB) or the Cultural Background; (LE) or Life Experiences, and (CC) Current Context. Small group discussion encourages the students to examine their beliefs, values, attitudes,and emotions. Students in the Texas Governor's School come to Beaumont, Texas from throughout the state, and they reflect the diversity of Texas with Hispanic, African American, Asian and Anglo student participants. The students discover that in many ways people from different cultures and background hold similar values and beliefs, and in discussions they become aware of their “lens of identity” and the “lens of socialization” with the accompanying stereotypes inadvertently picked up in school or in their home. One Asian student with a Pakistan family background enthusiastically shouted across the room to one of the Indian students,” I have hated people from India all of my life, and now you are my friend.” This spontaneous exclamation was followed by a bear hug, as he flew across the room to embrace his fellow student.

**Congruence.** Scharmer (2009) recommended stepping outside one's self for an examination of congruency. The TGS students have journal writing time with their counselors each evening, and they discuss how well they are able to "listen closely" which represents a strong component of Theory U. The students reflect on questions such as: Do I walk my talk? Do my actions match my values and beliefs? One student shared how he always sits with other Hispanic students in the cafeteria, and said, "If I accept and value students from all groups equally, I guess I need to consciously choose to sit with students from other cultures.....and I will." He continued, "I am on the Student Council in my school and I need to use that same "congruence" of my actions and beliefs in my school, so others will see me doing this."

**Commitment.** This core value involves making a significant investment in individual and group tasks. Each time the students work together, they discuss the commitment each person makes to the overall task. One observation by a student leader summarized his thoughts about commitment. "Did you notice as we all got involved and shared our individual research reports, the time flew by, and the whole group was more energized....energy multiplies." At that point, the TGS instructor added Carl Jung (1963) concept of *synchronicity* and how the students had experienced an energy flow, as discussed by another psychologist Csikszentmihaly (2008).

## Group values

**Collaboration.** Each time the TGS students work together to come up with creative solutions to issues in their *Energy Conservation and Sustainability* class, there is shared responsibility. Several students said they recognized the self-imposed limits they place on the way they think. One said, "If I can't quote someone who has written about the topic we are studying, I don't go the extra mile, and share my own thinking...I don't even do thinking on my own at school, as I do here." The students publish a daily newsletter and several "reporters" interviewed community leaders in energy production and distribution. One student interviewed the Director of Shangri La Botanical and Nature Center, using Wind Power and Solar Power, said, "I never thought I could talk to such a smart man about energy and not feel dumb. He actually complimented me on my questions." and she continued, "The other reporters were excited about my interview."

**Common Purpose.** In the SCM shared vision and purpose are essential. This phenomenon is quite effective with the students as they work in small groups in their classes deciding on the questions they want to address and how they will share the information. One group decided to raise awareness of the college age students at Lamar University concerning conservation of energy. They designed "sticky" 3 x 5 cards that could be placed near each light fixture with a Cardinal cartoon character (the Lamar mascot) saying "Turn it off". Each of the l00 students made l0 cards, so they were able to place l,000 cardinals on light fixtures urging energy conservation.

**Controversy with Civility.** This core value is most appreciated by the instructors of TGS. Gifted students often get bogged down with critical comments, and learning how to disagree with civility is essential, especially when there are heated discussions in the classes. There is an emphasis on listening to one another's point-of-view and the instructors ask the students to share points-of-view that stretch their thinking. Sentence stems or starters are introduced such as, "I liked what you said, it made me think of ..... or "There is another way of looking at that, have you thought about....." These sentence stem starters add to the civility between the students during controversy over ideas or concepts.

## Community Values

**Citizenship.** This core value is observed when all of the TGS students in a group work together to plan, develop and present an evening seminar. As they value and sense their interdependence, they support one another. If one student falters in a presentation, another student steps up and unobtrusively brings the discussion back to its topic, almost as if it had been previously orchestrated.

Change is the major goal of leadership in the SCM model and engaging the TGS students in small group activities to address the issue of energy conservation and sustainability encourages them to work together to suggest directions for positive social change. Scharmer (2009) said the single-person-centric concept of leadership is outdated, and the process of leadership takes place though collective, systemic and distributed action.

## Tapping our collective capacity

Scharmer (2009) in the executive summary to his book *Theory U: Leading from the Future as It Emerges* said there is a need for a new consciousness and a new collective leadership and he stressed the importance of the *inner place*. He said, "Successful leadership depends on the quality of attention and intention that the leader brings to any situation. Two leaders in the same circumstances doing the same thing can bring about completely different outcomes, depending on the inner place from which each operates." (p. l)

According to Scharmer, leadership is about shaping and shifting how individuals and groups attend to and subsequently respond to a situation. He listed four different types of listening:

### Listening l: Downloading

When you are in a situation where everything that happens confirms what you already know, you are listening by *downloading*. One TGS student remarked that most of his classes in high school called for *downloading*. Several others agreed and added that most lessons not only reconfirmed what they already knew, they already knew "the stuff" from middle or elementary school.

### Listening 2: Factual

*Factual listening* is the basic mode of good science, and you switch off your inner voice of judgment and listen to the voices in front of you. Scharma, Senge, Jaworski and Flowers used *factual listening* as they interviewed l50 people, paying close attention to the facts and to novel or disconfirming data. In factual listening, you let the data talk to you and you ask questions, and you pay careful attention to the responses you receive. Scharma's latest book with Karin Kaufer (2013) *Leading from the emerging future: From ego-system to eco-system economies* chronicles their interactions with numerous individuals as they applied Theory U to transforming business, society and self.

### Listening 3: Empathic

In *empathic listening* you move from the *it-world* of things, figures and facts to listening to the story of a living and evolving self to the *you-world*. This was noted with the TGS students when they were talking about coal being used as an energy source by some people in the United States. One student from the Rio Grande valley said her family used coal when it was cold, and when they did not have enough money to buy coal, they had to sleep in their clothes. The students near her empathically listened and moved in close, nuzzling her with warmth. They forgot about their own agenda and began to see how the world appeared

through her eyes. They were connecting directly with another person from within demonstrating emphatic listening as described by Scharmer.

**Listening 4: Generative**
Scharmer said this level of listening requires us to access not only our *open heart*, but also our *open will*--our capacity to connect to the highest future that can emerge. Generative listening involves *presencing* and collective creativity.

## Theory U: One process, five movements

Scharmer and Jaworski visited with Brian Arthur, the founding head of the economics group at the Santa Fe Institute. Arthur said there are two fundamentally different sources of cognition. One is the application of existing frameworks (*downloading*) and the other is accessing one's inner knowing. Arthur emphasized that all true innovation in science, business, and society is based on inner knowing. They asked him, "How do you do that?" He said there are three movements, the first is observe, observe, observe. The second movement is to retreat and reflect and allow the inner knowing to emerge. Arthur said go to the inner place of stillness where knowing comes to the surface and listen to everything you learned during the observe, observe and then attend to what wants to emerge. The third movement, according to Brian Arthur is acting in an instant. This means to prototype the *new* (make a model) in order to explore the future by doing (Scharmer & Kaufer, 2013, p.170). Scharmer added two more movements, *co-initiating* which is an initial phase of building common ground and a concluding movement that focuses on reviewing, sustaining, and advancing the practical results of the prototype (*co-evolving*). Scharmer calls this the U journey and it is depicted in Figure 2.

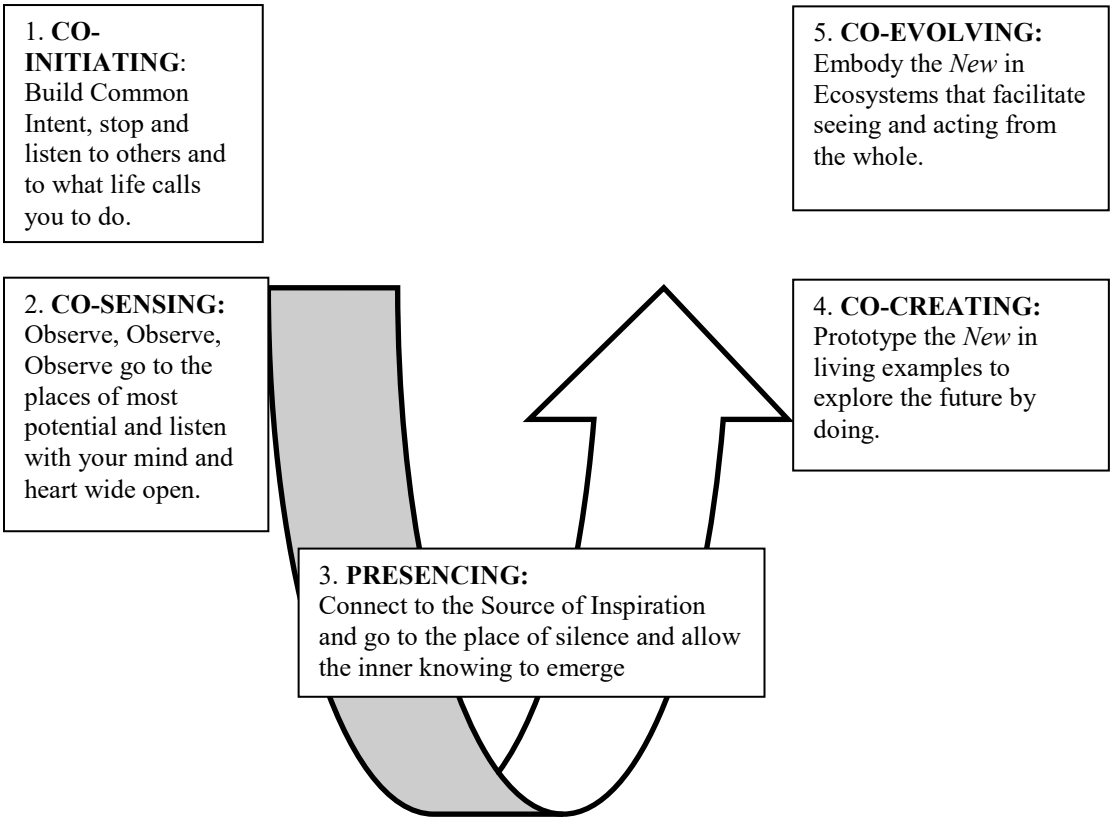


**Figure 2:** Adapted from the Scharmer U Journey model (Scharmer, 2009, p. 19).

**Co-initiating:** *Build common intent, stop and listen to others and to what life calls you to do*. When the staff introduce co-initiating to the students in the TGS Energy classes, they encourage them to identify an issue in which they want to make a difference in ways the issue is handled. The students wanted to build greater understanding and awareness of solar and wind power and to build community awareness of these two energy sources. This represented the group's common intention.

**Co-sensing:** *Observe, observe, observe. Go to the places of most potential and listen with your mind and heart wide open*. The students and TGS staff made arrangements to visit Shangri La Botanical Garden and Nature Center where both wind power and solar power are used. The students interviewed Dr. Hoke the director of Shangri La who is passionate and knowledgeable about wind and solar power, and they asked him why more people are not using these new forms of energy.

**Presencing:** *Connect to the source of inspiration and common will. Go to the place of silence and allow the inner knowing to emerge*. The students were urged to think about the issue of building community awareness and to be quiet and let their ideas *flow*. On the bus ride to the University from Shangri La, the heightened excitement was quite evident, but they dutifully went to their rooms for some "quiet time."

**Co-creating:** *Prototype the new in living examples to explore the future by doing*. When the students discussed their quiet time, several said they needed to know what people want to know about wind power and solar power. Scharmer said in the co-creating movement the group needs to explore the future by "doing" and to come up with a set of small living examples. The students decided to interview Lamar University students, faculty and parents with four questions: Do you think wind power and solar power are viable energy sources? Would you use either one if you could do so? What is keeping you from using wind or solar power?, and Are most people aware of these two energy sources? Each of the 25 students in the Energy Production and Conservation class agreed to interview 4 people, so they had l00 responses.

**Co-evolving:** *Embody the new in ecosystems that facilitate seeing and action from the whole.* The students shared information with one another and asked the local newspaper the *Beaumont Enterprise*, if they could write an OPT piece with their findings. They were elated that the Editor was most receptive. They also decided to share their findings in an evening seminar with all of the TGS students, and one student who lives next door to the Beaumont Mayor invited her to the seminar. She attended and was so enthusiastic about their research that she invited the students to speak at the next City Council Meeting. The students concluded they had followed the five movements to discover the future by doing.

## Border crossing between science and the humanities

Ambrose suggested expanding and strengthening interdisciplinary work in gifted education, and with the support and assistance of a number of *Teacher Quality Grants* in Biology, Earth Space Sciences and Mathematics (1994-2014) Lamar University has trained over 300 elementary and middle school teachers in Science and Mathematics with advanced content and inquiry as an organizing construct. The teachers and their mostly low income minority students attended "hands-on" and "minds on" inquiry Saturday seminars, taught by Lamar University Science professors. In addition, in a Javits grant *Scientists-in-Schools* (2002-2008), 250 high potential middle through high school students were identified and

provided Saturday labs with accelerated and extended Science content taught by Lamar University professors in the Chemistry, Biology, Physics and Earth Space Science departments. The students were identified at the 8th grade level and followed through graduation from high school. Each year, an additional new set of fifty students was added for a total of 250 student participants in the five year period. The Lamar University Science professors worked in the schools demonstrating inquiry in science side-by-side with the teachers and students. The major goal of the Scientists-in-Schools project was to ensure that the participating students graduated from high school, maintained A/B grades, applied to colleges and universities and selected STEM as a major and future career goal. At the end of the five year period, all but one of the students graduated from high school, all maintained A/B grades, 243 students applied to colleges and universities, and 52% of the college and university applications listed STEM as a major. Using A/B grades and achievement test scores at the 85%-90% level, and teacher recommendations, 243 of the students were recommended to the local Beaumont, Texas Independent School District (BISD) gifted program. One "spin-off" value of the "border crossing" of the Scientists-in-Schools project between Education and the Sciences was the consciousness raising of the Science professors on the importance of "hands-on" instructional engagement. They said their college classes were moving toward more practical application and activities, and less lectures. In addition, several of the professors began serious mentoring of undergraduate students, since they had noted the positive effect of student motivation in the close involvement and support of the Scientists-in-School staff and instructors.

A Texas Work Force grant in 2015 will work with 57 l0th-12th grade students focusing on Energy Conservation and Sustainability. The students will attend the Texas Governor's School (TGS) in a three week summer program (June l4-July 3). Physics and Earth Science professors will provide two Academic courses: *Energy, Past, Present and Future, and Energy Conservation and Sustainability*. The participating students will identify issues in energy development and sustainability and create prototypes of their findings and "thinking." Spindletop and Gladys City are located on the Lamar University campus and the students will have opportunities to visit and learn how oil was first discovered in Gladys City. Border crossing will take place between Science and the Humanities using the ideas of Carl Jung (1963). Jung was influenced by Niels Bohr, Wolfgang Pauli and Albert Einstein. In numerous discussions with them, he recognized the equivalence of the atom as a basic unit in physics and psyche as a basic unit in human beings (Sisk & Torrance, 200l). Jung wondered if great amounts of energy could be released by breaking the elemental unit of the atom, could equivalent amounts of energy be brought forth from the psyche. In a sense, this represents what Scharmer and his colleagues strive to do with collective energy using the open mind, closing down judgment, the open heart with empathic listening and the open will to seek change. The TGS students will be encouraged to note in their small group work how working together in a supportive journey in the U theory model, psychic energy with ideas and prototypes can be realized. Several Humanities professors will introduce the students to the poetry of Hafiz and Rumi and the Sufi tradition of wisdom of the heart.

## Wisdom of the heart

In Western culture logical reasoning is considered one of the highest human skills and the primary way to gain knowledge and wisdom. In the Sufi tradition, the abstract logical intellect is called the lower intellect, and there is a higher level of intellect that allows one to pursue the meaning of life, and spiritual truths (Sisk & Torrance, 2001). This Sufi belief is

similar to the original meaning of Science as a search for truth. A Hafiz poem captures the Sufi thought about intellect.

> If you think that the truth can be known from words,
> If you think the Sun and the Ocean
> Can pass through that tiny opening
> Called the mouth.
> O someone should start laughing!
> Someone should start wildly laughing—Now!
> (Ladinsky, l995, p.43)

## Border crossing with the use of metaphor in sociology and psychology

Ambrose suggested using metaphor as an exploratory tool and thematic integrator for interdisciplinary work. The *Cage Painting Metaphor* in which the participants think of the bars of the cage as aspects of self as discussed earlier in this article was extended by Alagic, Nagata & Rimmington (2009) as an online simulation to improve intercultural communication, perspective taking and development of a global mindset. Students in TGS explore the cages of themselves and one another for self-awareness, and in discussions to build greater understanding of cultural similarities and differences. As the students discuss their Life Experiences (LE), Cultural Background (CB), and Current Context (CC) they asked if gender and age would be factors that affect the LE, and CC of individuals. They discussed how the Cage as a metaphor connotes a static setting similar to Paul Lawrence Dunbar's poem *I Know Why the Caged Bird Sings* or since the bars may be flexible, one can move on by communicating and learning with others, to not only build intercultural understanding and competence, but to further develop self-awareness and self-acceptance.

## Benefits of interdisciplinary work

Ambrose discussed the benefits of both narrow and broad interdisciplinary (ID) work; for example, interdisciplinary work between disciplines such as history and literature tend to simplify communication between the two disciplines, and they would be considered narrow ID work. Broad or wide interdisciplinary work is more complex, such as collaboration between the sciences and humanities. Currently, with the emphasis in the National Science Foundation (NSF) with requirements that the scientists collaborate with an educator in proposed funded projects, this provides a splendid opportunity for gifted education to partner with their science colleagues. The scientists that I have collaborated with are intrigued with the *quick minds* and *natural curiosity* of the gifted students with whom they have worked side-by-side with in the Javits Scientists-in-School project. Prior to this collaboration, many of the scientists in Physics, Earth Space Science, Chemistry and Biology were skeptical about working with educators. They "pawned" the courses for teachers in the sciences to the new Assistant Professors, openly stating the need to "water down" the courses for educators, in comparison to the rigor needed for Pre-Med majors. This attitude dramatically changed since the Scientists were involved in hands-on activities in the schools with excited and eager teachers and students. In addition, the Texas Science TEKs call for studying the Scientists who have made contributions to the field, which opens the door to the Humanities, as professors in the Humanities can share the life journeys of many outstanding scientists, since many scientists such as Nikola Tesla were creative scholars as well as scientists.

One very positive benefit of interdisciplinary work is the sharing of instructional strategies among the disciplines. A colleague in Earth Space Sciences, Dr. James Westgate and I submitted an NSF proposal *Geoscience Pathways* to provide a field experience in Utah

for low income minority undergraduates with a special outreach to females. The students will spend two weeks at the "dig" searching for pre-mammalian fossils. The proposed project has intellectual merit with the potential to advance the knowledge of ways of developing the talent of diverse students, and to add to the knowledge base of how culture including the families of diverse students affect their learning and pursuit of academic studies. The rationale of the program is based on the work of Gregerman (2014) who said many diverse students do not identify with the academic mission of universities, and there is a need for close contact with faculty as a key to successful learning and retention of diverse students. When the students return to Lamar University, the education partners will work with the students in planning, developing and implementing power point and oral presentations to share their findings at state and regional conferences. This will involve teaching the undergraduate students communication skills, critical thinking and group skills to facilitate collaborative work habits and attitude. These high potential youth (six each year) for a total of 18 students over a three year period will participate in the field study in Utah with the express goal of motivating them to select Earth Science as a major, and career. As mentioned earlier in this article, the professors with whom I have collaborated over the last few years have shared how they added more "hands-on" real life activities and mentoring opportunities with their students.

As we work together, we pool our approaches and modify them, so that we are better suited to address the problem at hand, such as the dig in Utah. Dr. Westgate, a full professor in Earth Space Science will guide the dig and I will work with the students in writing their resumes` and invitational letters for internships. In the Teacher Quality grants the scientists team-taught with me in Biology, Chemistry, Earth-Space Science and Physics. In another collaborative with a Chemistry professor Dr. Suying Wei who submitted a collaborative NSF will work directly with the Texas Governor's School students this summer in sampling and testing water samples from throughout the southeast region of Texas. This experience will motivate these l0th, 11th and l2th grade gifted students to view science in its real meaning--a search for truth. Our overall goal is to help the gifted students in the Texas Governor's School and the undergraduates participating in the NSF funded programs to develop skills in analyzing, evaluating, and synthesizing information from a variety of sources in order to make reasoned decisions about their hands-on research on sustainability of water in southeast Texas. In addition, there is increased collaboration in the sciences at Lamar University with Biochemistry, Biomedical Engineering and Neuroscience, as well as Cybernetics as career paths that provide challenging new fields for both faculty and students.

Ambrose's concern about gifted education staying "silo-bound" is a valid one and the World Council for Gifted and Talented Children under the leadership of Taisir Subhi Yamin served as an active organization for international interdisciplinary communication. In addition, the International Centre for Innovation in Education (ICIE) founded by Taisir Subhi Yamin; Ken McCluskey; Todd Lubart; Sandra Linke; and Heinz Neber is dedicated to forging partnerships with individuals and groups through professional conferences. The ICIE *International Journal for Talent Development and Creativity* will connect educators and create a spirit of global citizenship to help educators to explore new dimensions in working with children and youth. In the last sentence of his article, Ambrose writes that "extending interdisciplinary work in the field beyond these projects will be worth pursuing." I would definitely agree and as he said, "... in so doing, we can generate refinements that can extend and strengthen the conceptual frameworks for the field (Ambrose, p.36). The interconnectedness of the world with the internet and the interdependence due to trade liberalization calls for future graduates to be interculturally and globally competent. Ambrose

has pointed the way with his recommendations for educators to work toward broader understandings and coexistence in today's challenging world.

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## About the Author

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**Commentary (6):**

# Giftedness, Expertise, Excellence, Creativity ... Giftedness ... A Chronicle of a Developing Interdisciplinary Study as an Example

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**Keywords:** Interdisciplinarity; breaching boundaries; new directions; giftedness; expertise; excellence; creativity.

In his article, "Ten cheers for interdisciplinarity: The case for interdisciplinary knowledge and research", Nissani (1997, p. 212) describes the negative attitude in the past toward people who engaged in interdisciplinary thinking, stating that some called them "amateurs and outsiders" who are consequently liable "to miss essential facets", while others argued that "they often blunder, as did the many 'inventors' of perpetual-motion machines", and that these and similar arguments can also be heard today. For example, even today some warn against situations wherein people engaging in interdisciplinary research "risk dilettantism to gain a bird's eye view" instead of focusing on a specific discipline, and rather than specializing "become a jack of all trades, master of none". Another warning refers to the concern that engaging in interdisciplinary research is liable to result in researchers becoming cut off from the process of constant "fresh infusions of disciplinary knowledge". He concludes by referring to the argument concerning the demanding nature of interdisciplinarity, since "…To keep reasonably abreast of just two fields, for instance, requires tremendous investment of time and intellectual energy" (p. 213).

However, despite all this, and although even today there are some who have reservations concerning the very ability of interdisciplinarity to advance knowledge or create valuable and meaningful new knowledge, many advocate and defend it and its abilities. The latter, who do not ignore the potential difficulties, also focus on its advantages, for example: it challenges existing equilibriums within disciplines, and can thus lead to renewed thinking, to new directions of thinking, and to the creation of new, unexpected, and oftentimes valuable knowledge; it contributes to filling disciplinary gaps by employing knowledge from one discipline to fill knowledge gaps in another; it helps to contend with problems to which each separate discipline does not have a solution, either due to their complexity or because they fall between disciplines. The time required to engage in it and the considerable energy it demands are one of its strengths, since it is precisely the continuous thinking process that invites new combinations, can engender a new multidirectional perspective, and develop new insights at different points in the course of the process (e.g., Brewer, 1999; Franks et al., 2007; Lungeanu, Huang, & Contractor, 2014; Nissani, 1997).

In this spirit, Ambrose (2015) recommends that giftedness researchers, too, consider increasing their interdisciplinary thinking. He draws attention to the expected difficulties and

at the same time to the potential inherent in conducting interdisciplinary research. Perhaps as in other fields, he continues, interdisciplinary thinking can contribute to filling gaps in the field of giftedness research, enrich existing knowledge, facilitate greater understanding of issues that are still insufficiently understood, and germination of new integrative ideas that will be created by breaching the disciplinary boundaries and grow from new connections.

In this response paper I wish to join Ambrose (ibid.) and, like him, advocate the potential inherent in interdisciplinary thinking to advance knowledge in the field of giftedness. In my view, too, the open nature of interdisciplinary thinking provides opportunities for combinations on different levels and in different directions between giftedness research and other disciplines, close and distant alike, and can also lead to enrichment of our understanding in this field and engender new insights.

## What does all this remind me of?

This discourse reminds me associatively of The Structural Holes Theory. According to this theory, the access a given group has to different knowledge sources is determined by the connections it has with other groups. In most groups the social structures are typified by dense clusters of connections. The knowledge in each cluster circulates among the people in that cluster, and thus tends to be repetitive in terms of its members' language, research approaches, subjects of interest, and inclinations. Accordingly, a network is formed in each cluster within which the group members tend to focus their activities. In the language of organizational networks, structural holes are created when there is no direct connection between two (or more) groups. In other words, the knowledge in each group is only known within it and is not shared with other groups (Green & Rein, 2013). Burt (2001) describes it thus: "Information circulates more within than between groups – within a work group more than between groups, within a division more than between divisions, within an industry more than between industries". He goes on to explain (2005) that structural holes constitute a buffer between different groups: within each group there is greater homogeneity of behavior, opinions, outlooks, ways of thinking, and ideas than between groups. However, it is precisely for this reason that going outside the boundaries of a group's thinking and practice, and breaking down the buffer between it and another group can lead to the emergence of new thinking that breaches the boundaries of each group's ideas, and enriches knowledge in the group as well as in the organization within which these groups exist.

An interesting example of what an encounter between two groups can engender, even two distinct groups within the same organization, is presented by Dr. Iris Ginzburg (Director and General Manager of the MBA Program for Management of Technology, Innovation, and Entrepreneurship at Tel Aviv University) who founded and was the global leader of IBM's Innovation Management Practice, in an interview conducted with her in preparation for an article engaging with the question: How are new ideas born? In the article, written by Ben-Bassat (2014) and published in *Alaxon*[1], one of the most intriguing interdisciplinary digital magazines in Israel, Ginzburg draws a connection between structural holes and how innovative ideas are born in an organization, and is quoted as saying:

In every organization there are units with specific roles and specific knowledge, and in the 'space' between them there is a deficiency of knowledge. Connecting two particular

[1] Alaxon – Hebrew for *diagonal*, as in the Talmudic sentence: *The line of life is a diagonal between duty and desire. Alaxon* is a digital magazine for thoughts, articles, notes, and new ideas.

bodies can create innovation with relative ease. When I was a researcher at IBM, a decision was made one day to combine the research division and the business consultancy division, two bodies that seemingly have no connection. This linkage immediately created all kinds of interesting constraints and connections that came from different people, and certainly produced new directions.

Another example is presented by Burt (2004) in his attempt to illustrate how breaking down the buffer creates an opportunity for innovation. The example is taken from Richard Swedberg's[2] reference to the communication that needs to be established between sociology and economics and between researchers and experts in the two disciplines. Burt writes:

Swedberg (1990, p. 3) begins his book on academics working the boundary between economics and sociology with John Stuart Mills's ([1848] 1987, p. 581) opinion that it is hardly possible to overrate the value… of placing human beings in contact with persons dissimilar to themselves, and with modes of thought and action unlike those with which they are familiar… such communication has always been, and is peculiarly in the present age, one of the primary sources of progress (ibid, p. 350).

## My example

I seek to illustrate the advantages of interdisciplinarity for giftedness research by means of an example of one study that developed in different directions over ten years, and engendered new directions of thinking, connections, ideas, and knowledge. I have chosen this example since on the one hand it can indicate the potential inherent in interdisciplinarity for giftedness research, and on the other, it indicates additional possible directions of research and invites additional researchers to develop it further. I conducted the interdisciplinary thinking process throughout the study together with a particularly creative colleague, Prof. Malka Gorodetsky of the Education and Chemistry Departments at Ben-Gurion University of the Negev in Be'er Sheva (Israel), and an interdisciplinary researcher in her own right.

## The first stage

### 1. The point of departure and objectives of the study

In the first stage, the idea of conducting an interdisciplinary study emerged from a practical need: we decided to avail ourselves of the wealth of knowledge in the field of expertise research in order to understand the cognitive performance of gifted students. The motivation to embark on interdisciplinary research from this point of departure is called '*instrumental interdisciplinarity'* (see for example, van Baalen & Karsten, 2012, based on Klein, 1990).

Our aim was to understand the cognitive performance characteristics of (intellectually) gifted students, who are defined as possessing high general abilities as they are expressed in intelligence tests and similar academic tasks with which they contend at school (Sternberg, 1998). Insufficient understanding of this subject has prompted various researchers to recommend taking action to address this deficiency (Rabinowitz & Glaser, 1986; Shore, 1991; Shore & Kanevsky, 1993). One of the recommended ways to achieve this is to draw on the wealth of findings and conclusions in the research literature on the

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[2] See further development of the same idea in Swedberg's later book (particularly the first two chapters): Swedberg, R. (2003). *Principles of Economic Sociology*. Princeton University Press.

performance of other types of exceptional students, such as experts (whose excellence is based on learning and is prominent in specific domains). Thus for example, according to Hong (1999) (to whom Ambrose refers in his anchor article), there is a profound deficiency in understanding the mind of the gifted; compared with the progress in understanding human cognition in general, and with reference to expertise in particular, the understanding of giftedness has remained lagging far behind. Consequently, he calls for cognitive research of giftedness to be advanced from an understanding that a 'successful marriage' between giftedness and expertise through the prism of cognition and information processing, including subjects such as knowledge, learning, problem solving, and so forth, can yield additional understanding of the performance of the gifted.

The specific research question we defined at this stage was: What characterizes problem-solving processes in the gifted in comparison with the non-gifted?

## 2. The integrative, interdisciplinary model we built

In order to examine the research question, we built an integrative model to analyze the solution processes of gifted/non-gifted students as reflected in their post-solution protocols. The model was formulated as a mapping sentence (see Figure 1, Appendix 1), i.e., a semantic frame for describing observed information. The sentence is comprised of six facets, five of which relate to the components of the solution process, and the sixth to the correctness of the solution. Three of the process components (encoding, combination, comparison) are taken from the literature on the gifted, where they were found to be key components in understanding the uniqueness of their performance (Davidson, 1986; Davidson & Sternberg, 1984; Sternberg & Davidson, 1982, 1983, 1986), and two components (retrieval, goal directedness) were added to the model since they were found to be central components in explaining the exceptional performance of experts (e.g., Berger & Wilde, 1988; Chi, Feltovich, & Glaser, 1981; Gobbo & Chi, 1986; Low & Over, 1992; Reed, Willis, & Guarino, 1994; Rabinowitz & Glaser, 1986; Resnick, 1985).

A hierarchy of characteristics was defined for each of the sub-processes that can characterize their performance, from the most effective/selective to the least effective/selective. Whereas we borrowed the term 'selectivity' from the studies of Sternberg and Davidson (1982, 1983, 1986) on (intellectually) gifted students, we defined the characteristics of each of the sub-processes in accordance with the literature on problem solving, especially analogical thinking and problem solving.

Based on the components of five sub-processes (A to E) in conjunction with the concept of selectivity as an ordinal dimension (rather than dichotomous, as used by Sternberg & Davidson, ibid) we built a model to analyze the solution processes of gifted/non-gifted students as reflected in their post-solution protocols.

The mapping sentence enabled analysis of the entire reported solution process, as well as of each separate sub-process, and allowed us to obtain a solution profile for each solver. The Most Selective Profile (MSP) was defined as one in which the solver encodes deep-structure items, retrieves deep-structure information relevant to the interpretation of the problem, performs an integrative combination in a process directed to the final goal, and reports on the comparison of only deep-structure relationships with an analogical problem from past learning (Gorodetsky & Klavir, 2003, p.11).

The study was carried out on 121 eighth- and ninth-graders (60 gifted and 61 non-gifted) who solved insight-mathematical and non-mathematical (verbal) problems, without

and with analogical learning, and were asked to report on the solution process they underwent.

## 3. What did the study enable us to learn?

### *About the model*

The model was found to be an effective tool for analyzing the sub-processes employed during problem solving.

### *About the cognitive performance of gifted students*

At this stage the study enabled us to learn a great deal about the problem-solving performance of gifted students. I shall present four main conclusions:

a. Gifted students tend to arrive at more correct solutions than their non-gifted counterparts (Facet F).

b. There is an evident connection between giftedness and selectivity in the solution processes. In the gifted students the processes of arriving at correct solutions are more selective and include a higher rate of MSP.

c. While analogical learning advances all solvers, it advances gifted students to a much greater extent. This is manifested in greater improvement following learning, both in the correctness of the solution and the level of selectivity employed in the solution process.

d. The difference between the performance of gifted and non-gifted students is not only manifested in quantitative differences (as described in Section [a] above), but in qualitative differences as well. In other words, although both the gifted and non-gifted students were able to arrive at correct solutions, the study shows that they employed different sub-processes (for a detailed description of the study, see Gorodetsky & Klavir, 2003; Klavir & Gorodetsky, 2001).

## 4. To what extent did interdisciplinarity help us to meet the need?

The study described above enabled us to deepen our understanding concerning the cognitive performance of gifted students, and contributes an additional layer of understanding on the cognitive performance of the gifted, which is still insufficiently understood and researched. Thus for example, Dai, Swanson and Cheng (2011) reviewed 1234 studies on giftedness published in the course of twelve years (1998-2010), and found that only two explicitly built on expertise research. According to the researchers, an insufficient number of studies are conducted from this perspective in light of the substantial deficiency that still exists in understanding the cognitive performance of the gifted. Interdisciplinary studies combining giftedness and expertise research can potentially fill this void. Consequently, the interdisciplinary model we built indeed met the need, and enabled us to enrich and to deepen the knowledge and understanding of giftedness. Thus for example, result (c) above sheds light on the learning ability of gifted students; it refutes the notion that "there is no such thing as giftedness" since anyone who makes an effort to learn can attain the same achievements as the gifted. Result (d) enables us to deepen our understanding of the qualitative difference in the cognitive performance of the gifted and non-gifted, in addition to the more familiar quantitative difference, which is also manifested in the present study (see results [a] and [b] above). However, more researchers and further studies are needed to add additional layers of understanding. Combining knowledge from the fields of giftedness and expertise can aid them in this task.

### 5. Where did all this lead us?

As with any interdisciplinary studies that engender ideas for new interdisciplinary questions, led to the creation of new integrative fields of study, and to spark ideas for new research perspectives, thus too, with the present study. The study sparked a new idea that led to the second study, which we conducted in the next stage.

## The Second Stage

### 1. The point of departure and objectives of the study

Whereas in the first stage the idea to conduct an interdisciplinary study emerged from a practical need, an instrumental motivation, the second study was motivated by what researchers term 'synoptic interdisciplinarity' (van Baalen & Karsten, 2012; Klein, 1990). In other words, the decision to conduct an interdisciplinary study is based on the desire to combine disciplines in order to investigate a broader phenomenon or phenomena in terms of their level of generalization: "It is assumed here that in the end through methodological unification, a sound coherent theory, which is applicable to a wide range of problems can be developed" (Klein, 1990, in van Baalen & Karsten, 2012, p. 221).

This time, however, our objective was to employ the integrative model in order to investigate the exceptional cognitive problem-solving performance of gifted and expert students. In fact, our objective was twofold: first, we thought that employing a unified framework to study the two groups could contribute to understanding exceptional performance as a general phenomenon (by identifying the similarities between the groups of exceptional students); and second, we thought that in this way we could also deepen our understanding of the exceptional performance of each of the two groups by identifying the uniqueness of each one.

For this new idea, too, we found support in the professional literature from a number of researchers (e.g., Anderson & Lebiere, 1998; Biggs & Moor, 1993; Rabinowitz & Glaser, 1986) who saw possible potential in this perspective for advancing the understanding of superior performance as a joint and unified interdisciplinary field of research. According to them, this perspective is important in light of the reverse trend that is also developing within excellence research, which is typified by increased differentiation and division into different types of excellence (see for example the division into different types of expertise in chess, Charness, 1991; medicine, Patel & Groen, 1991; and sport, Allard & Starkes, 1991). However, although the benefits of a unified framework have been documented, very little experimental work is offered in the research literature.

### 2. Use of a common interdisciplinary model for analysis

In this study we sought to propose a preliminary attempt to unify the study of gifted and expert students into a single conceptual experimental framework (Klavir & Gorodetsky, 2009a, 2009b). To this end we built a unified framework that included the research design and interdisciplinary model employed in our first study. The participants comprised two groups of exceptional students: gifted students (N=153), and expert students in mathematics (N=78), and two comparison groups: non-gifted students (N=159), and novice students (N=117). The four groups established a continuum of populations of two age groups varying in their problem-solving capabilities and learning. The problems, which were adapted to the participants' age and spheres of excellence, included insight-mathematical and non-mathematical (verbal) problems.

## What did the study enable us to learn?

The study yielded a wealth of findings, which I shall not detail here. I have, however, selected a few examples to illustrate the possible contribution of a unified interdisciplinary study to understanding of three main points of the unified approach to excellence:

a. Use of a common interdisciplinary model for analysis enabled us to compare the excellence of gifted and expert students and to gain insights on the nature of the comparative excellence of the gifted and expert students (Klavir & Gorodetsky, 2009b, p. 29).

What we found concerning commonalities in performance of the two groups included the following: The study provided additional empirical support for the fact that the intellectually-gifted students (in comparison with the non-gifted) and the expert students (in comparison with the novices) arrived at solutions with a higher level of correctness, employed a more selective process, and benefited from learning. The latter capability was expressed in employing more correct solutions and more selective solution processes after analogical learning (Klavir & Gorodetsky, 2009b, p. 30).

We answered the question, what is the uniqueness of the excellence of the gifted versus that of the experts? Despite the similarities between the two groups, we found that each individual group is also unique. This is manifested in different aspects. For example, it seems that the excellence of the gifted students is more prominent before learning, whereas that of the experts, is about the same before and after learning.

### 3. To what extent did interdisciplinarity help us to meet the need?

Employing a common interdisciplinary model for analysis and the mapping sentence as an integrative 'ruler' to measure the exceptional performance of both groups, gifted and expert, yielded fascinating findings that can contribute to advancing the notion of unified inquiry into exceptional performance, or as Ericsson, Nandagopal and Roring (2009) term it: "science of exceptional achievement". One study cannot of course flesh out and fill the void in the field, and thus many additional studies are required in similar directions taken by the present study.

### 4. Where did all this lead us?

One of the most interesting conclusions emerging from the present study pertains to intellectual giftedness. When Ericsson, Nandagopal, and Roring (2009) propose establishing a science of exceptional achievement, they are in fact proposing that the existence of intellectual giftedness be challenged as a phenomenon of excellence underpinned by high general abilities. Instead, they propose that excellence be examined solely (or mainly) on the basis of the governing paradigm in expertise research, and recommend that it becomes the new field of inquiry in excellence research. According to Ericsson and his colleagues (Ericsson & Smith, 1991; Ericsson & Charness, 1995; Ericsson & Lehmann, 1996; Ericsson, Nandagopal, & Roring, 1995, 2009), excellence can only be explained by means of deliberate practice, motivation, and nurturing in specific disciplines.

The interdisciplinary study described here, and future studies that will be conducted along similar lines, can therefore contribute to an understanding of the place of intellectual giftedness within and in comparison to the 'family of excellences'. In the present study, at least, we found that intellectual giftedness is also entitled to be considered a specific type of excellence. We found at least two modest substantiations for this: first, like the experts, the gifted demonstrated exceptional performance both in terms of results (correctness of the

solution) and in terms of process (level of selectivity in the solution process); and second, despite the similarities between the two groups (experts and gifted), there are differences between them that are not necessarily expressed quantitatively, but also qualitatively, as described above.

Other researchers are of course invited to continue researching in this direction in order to examine the validity of our claims, and deepen the understanding concerning the nature of excellence by focusing on the commonalities and uniqueness of different types of excellence.

## The Third Stage

### 1. The point of departure and objectives of the study

The third study was in effect a continuation and development of the second one, and it, too, was motivated by synoptic interdisciplinarity. This time, however, we focused on examining the creative performance of exceptional students in order to understand the similarities and differences between the two groups. Having discovered that employing a common interdisciplinary model for analysis enabled us to arrive at interesting new insights concerning the characteristics of exceptional problem-solving performance, we sought to employ it to examine how creative performance is manifested in inventing new problems. The rationale for this study can be described as follows:

Although the term 'excellence', which frequently refers to exceptional, outstanding, and rare achievements, is widely used in the academic community, it is actually a vague and ill-defined concept. The study, whose objective is mapping and conceptualizing the unique features of excellence, mainly focuses on the study of two populations of excellence: gifted and expert students. A meta-analysis of these studies revealed the similarities in the nature of excellence of these populations, and a call was made for an integrated inquiry that would engender a better understanding of excellence. Creativity was found to be one of the common characteristics of gifted and expert students (Klavir & Gorodetsky, 2009c, p. 164).

### 2. The integrative, interdisciplinary model we built

The creative assignment we chose was to invent a new problem that is analogous to a learned problem (see the second study), and we asked the participants to "invent a similar problem to the previous one, but as original as possible". To analyze the participants' performance we employed a creativity analysis model, The 4 Ps of Creativity, which is used to examine creative performance and focuses on four aspects: the Person, the Process, the Product, and the Press (context/environment) (Basadur & Hausdorf, 1996; Klavir & Gorodetsky, 2009b, 2009c; Plucker, Beghetto, & Dow, 2004). According to Kleiman (2005), whose approach we adopted, "While each of these four dimensions can be chosen as a separate variable for the analysis of creativity, the use of all four in a given study of creativity provides more meaningful and comprehensive research results". (page 13)

Employing a model from the field of creativity analysis as an additional component of a common conceptual and interdisciplinary model for analysis enabled us to examine the similarities and differences between the two groups of exceptional students with reference to each of the four components (for full details, see Klavir & Gorodetsky, 2009c)

### 3. What did the study enable us to learn?

#### *a. Three new criteria enabled us to analyze the findings obtained from the model:*

1. *Relative creativity* was defined as expressing the creative behavior of exceptional students compared to their groups of comparison (gifted vs. non-gifted students, and expert vs. novice students).

2. *Comparative creativity* was defined as the creativity of the exceptional populations (in our case, gifted and expert students) as demonstrated in a given context (the press).
3. These two criteria enabled us to address creativity as a general phenomenon of excellence, and to pinpoint similarities/differences in the nature of creativity between different populations of excellence (Klavir & Gorodetsky, 2009c, p. 233).
4. *Level of cumulative creativity*. This measure was assigned on the basis of the four criteria of creativity mentioned above (**P**erson, **P**rocess, **P**roduct, **P**ress). Two levels of cumulative creativity were assigned: *High cumulative creativity* was assigned to students who constructed a new problem (**P**erson), their process was judged as expressing high flexibility and meaningful elaboration (**P**rocess), and the new problem was assessed as very original (**P**roduct) in the specific context of the study (**P**ress). *Low cumulative creativity* was assigned to the rest of the students. The level of cumulative creativity was calculated for each of the four groups: gifted, non-gifted, expert, and novice students. The higher the level of accumulated creativity a group exhibited, the more creative it was considered to be (Klavir & Gorodetsky, 2009c, p. 229).

These criteria, which as we shall see helped us to understand excellence in greater depth, are recommended for continued application and development in additional continuation studies that will focus on the connection between excellence and creativity.

***b. What did the third interdisciplinary study add to our understanding of the creative performance of exceptional students?***

I have chosen to present two main findings and their implications:

1. Both exceptional populations, gifted and experts, exhibited high *relative creativity* compared to their comparison groups. Both groups exhibited a higher degree of willingness (motivation) to get involved in a creative process (**P**erson). They performed more meaningful elaborations on the deep structures of the source problems (**P**rocess), and succeeded in constructing more original new problems than their comparison groups (**P**roduct) in the analogical-learning situation (**P**ress) (Klavir & Gorodetsky, 2009c, p. 233).

In general, these results support the assertion that excellence is indeed associated with creativity.

2. However, by employing the *comparative creativity* criterion we were able to obtain a higher resolution of the picture of excellence, and consequently the following interesting conclusion:

It was found that both groups of exceptional students performed poorly on *comparative creativity*. For example, only 50% - 60% of both exceptional groups were willing to get involved in a creative adventure (**P**erson). In addition, only few of the gifted and expert students achieved the highest level of creativity (according to the *cumulative creativity* criterion which summarized all four creativity components: **P**erson, **P**rocess, **P**roduct, **P**ress) (ibid).

***c. What did we learn about the uniqueness of each of the groups of exceptional students?***

1. *Relative creativity*: The major difference between the groups (gifted and experts) was their flexibility. What typified the gifted students was their pronounced ability for extending the surface structure of the problems to a different context in comparison with

non-gifted participants of the same age. In contrast, the expert students did not stand out in this respect in comparison with the novice students, since they were liable to be trapped in their past knowledge, and thus were found to exhibit a pattern of reduced flexibility in thinking when involved in the search for new solutions.

2. *Comparative creativity*: The major difference between the groups (gifted and experts) was their flexibility: only 10% of the gifted students achieved the highest level of cumulative creativity. This is a pretty grim picture of the situation that mandates urgent and immediate educational intervention. However, if the picture concerning the gifted students is pretty grim, the picture concerning the expert students is even grimmer, since only 3% of them achieved the highest possible level of creativity.

3. These and other results obtained in the third study reinforce, this time from the creative performance perspective, the conclusions we drew at the end of the second study concerning the need to continue investigating the different types of excellence by means of common models in order to understand the commonalities and uniqueness of different types of excellence: in learning situations, in tasks requiring problem solving and creative thinking, as well as other situations and tasks. Additionally, the findings of the third study further reinforce the conclusions of the second study concerning the understanding that intellectual giftedness is a unique type of excellence in comparison to other types of excellence (e.g., expertise, as in the present study) with regard to creative performance as well. Finally, one of the important conclusions emerging from the present study pertains to the relatively low creative performance of both exceptional groups: gifted and experts. This conclusion should lead us, giftedness and creativity researchers, to make a loud and clear call for increased fostering of creative thinking in different groups of exceptional students in schools.

**4. To what extent did interdisciplinarity help us to meet the need?**

According to Nissani (1995), the level of interdisciplinary richness can be evaluated in accordance with four criteria:

*a.* *Number* of disciplines involved. In the present study at least three disciplines were involved (giftedness, expertise, creativity), and possibly a fourth (if we define analogy research as a separate discipline).

*b.* *Distance* between the disciplines involved in terms of their world of concepts, thinking tools, research methods employed in them, and so forth. In this respect, the present study employed disciplines that are relatively close to one another.

*c.* *Novelty of the mixture itself*. The idea of combining the fields of giftedness and experts is not new; other researchers have proposed it before us and even actively engaged in it, as described earlier. However, the model we employed in the present study has a unique and innovative structure that has never before been used to study the cognitive and creative performance of excellent students of different kinds. Thus, the interdisciplinary model advanced another step forward in terms of its ability to continue to engender new interdisciplinary directions of thinking.

*d.* *Degree of blending or integration*. This criterion, which Nissani (ibid.) defines as the most important of the four and describes by means of a metaphor concerning mixing fruit: "The various fruits can be served side by side, they can be chopped up and served as a fruit salad, or they can be finely blended so that the distinctive flavor of each is no longer recognizable, yielding instead the delectable experience of the smoothie" (Nissani, 1995, p. 122). According to this criterion, it may be stated that the present study is

integrative to a relatively high degree, since the model we built includes amalgamation among concepts taken from analogy research and analogical learning, problem solving, exceptional performance of experts, exceptional performance of the gifted, and the field of creativity. They are all interwoven into an integrative and coherent mapping sentence that proved its ability to lead to interesting conclusions in the study of giftedness, expertise, excellence, and creativity.

## 5. Where did all this lead us?

The study conducted in the third stage took us an additional step forward in our ability to illuminate excellence in a more comprehensive light with reference to creative performance as well. Its findings even aroused in us a need to return to the intellectually gifted and deepen our understanding of the characteristics of their creative performance, which we indeed did in a later study (Klavir & Gorodetsky, 2011). I shall not expand on the findings of this study, but will state that the cumulative knowledge we acquired by means of the previous interdisciplinary studies is what led us to it and also helped us to conduct it.

## Summary

In this article I have described the chronicle of an interdisciplinary study that developed over the years. The strength of interdisciplinary research was illustrated by means of a description of the development of a study that throughout its different stages breached the traditional boundaries of giftedness research, and returned to the field of giftedness with a wealth of findings and insights. Breaching boundaries enables the importation of knowledge from other fields of knowledge. Integrating this knowledge with knowledge from the field of giftedness, as demonstrated in the present article, developed new areas of thinking, and at the same time contributed to filling gaps in knowledge that have been identified in this field. Interdisciplinary integration is what enabled us as researchers to obtain findings, to draw conclusions, and to make the recommendations required to fill these holes in knowledge, which we would not have been able to achieve otherwise. Interdisciplinary thinking conducted from an attempt to provide answers to an instrumental need can of course lead to different directions of research and derive knowledge different from that obtained through interdisciplinary thinking motivated by a synoptic need. However, given the two (perhaps more) possible directions in giftedness research demonstrated in the present article, conducting interdisciplinary studies holds infinite opportunities to develop our understanding of giftedness.

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# Appendix 1

| | A: Encoding | | B: Retrieval |
|---|---|---|---|
| | 1. deep-structure | | 1. deep-structure |
| In the solution process, the | 2. deep- and surface-structure | items, retrieves | 2. surface-structure |
| solver encodes mainly | 3. surface-structure | mainly | |

| | C: Combination | | D: Goal Directness |
|---|---|---|---|
| information relevant for interpretation | 1. integrative | in a | 1. is directed to the final goal |
| of the problem, performs a | 2. replicative | process | 2. proceeds by systematic search |
| combination that is | 3. distortive | that | 3. proceeds by random search |

| | E: Comparison | | F: Correctness of Solution |
|---|---|---|---|
| | 1. only deep-structure | | 1. correct |
| and reports | 2. deep- and surface-structure | relations with an analogical problem in | 2. partially correct |
| | 3. surface-structure | past learning, and reaches a solution that is | 3. erroneous |
| | 4. no | | |

**Figure 1:** The Mapping Sentence.

***Encoding***: the sub-process whereby the solver extracts information from a given problem; ***Combination***: the sub-process whereby the solver combines encoded information, its semantic interpretation and retrieved procedural knowledge into a solution structure; ***Comparison***: the solver's search for a pattern that may lead to a solution, and concurrent comparison of that pattern with possible solution structures attained in past learning. This sub-process is also called 'analogical reasoning' (Mayer, 1992; Kolodner, 1997) or 'analogical transfer' (e.g., Gick & Holyoak, 1980, 1986; Holyoak & Koh, 1987).

To complete the picture, two additional sub-processes, which were found to be central components in explaining the exceptional performance of experts, were added to the model (e.g., Berger & Wilde 1988; Chi, Feltovich, & Glaser, 1981; Gobbo & Chi, 1986; Low & Over, 1992; Reed, Willis, & Guarino, 1994; Rabinowitz & Glaser, 1986; Resnick, 1985): ***Retrieval***: activation of concepts and terms that enable the interpretation of a given problem into the solver's terms (we ascribe retrieval only to cases of declarative knowledge including semantic aspects of the text); ***Goal directedness***: the process of advancing toward the solution.

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**Commentary (7):**

# Are the Problems of Gifted Education Really about Discipline Myopia?

**Bruce M. Shore**
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**Keywords:** Gifted education as discipline; gifted education as field of professional practice; psychology of high ability; theory-practice gap; disciplines.

It is so tempting to make a comment or to add a detail about nearly every part of this provocative and engaging essay. With great difficulty I shall limit myself to a selection of key topics. My most general point is that I find myself agreeing with most of the broadest assertions, but not all, and squirming with many, but not all, of the specific points. As the title for my comments suggests, the central thesis of the essay raised my first eyebrow. After all, gifted education has been borrowing insights from "other disciplines" from the outset. However, nailing down that starting point is as difficult as nailing down a definition of gifted education. How about Plato's Children of Gold? Was that notion borrowed from the art if not discipline of politics? Or should we jump a couple of millennia to Galton and the discomfort of discussing the successes of the sons of gentlemen? To Binet who was trying to help identify children who would have difficulty in regular Paris classrooms, or Terman to help improve the identification of army officer candidates? I also wonder if gifted education is itself a discipline or if it should aspire to be one. Is it instead an area of professional practice supported by disciplines? I shall declare my bias up front: I do not regard gifted education as a discipline, and for decades have regarded "gifted education" doctoral programs that do not interface with a disciplinary (or multi-, inter-, or transdisciplinary) foundation as shortchanging their graduates as both scholars and practitioners. To me, gifted education is an area of professional knowledge and practice, and professions are duty-bound to be informed by disciplinary (including all the multi-, inter-, trans-, co- . . .) or they can never adequately inform practice with the aid of defensible evidence.

## Points of general agreement

Gifted education has no choice but to reach out to disciplines for all kinds of support. I absolutely agree that "the complexities of high-potential and high-performing human minds require insights from multiple disciplines." Ambrose's essay especially emphasizes conceptual support and the research methodologies. I would add that there is more to a discipline than these two dimensions, and that the others might be more salient. First, different disciplines favor different questions or curiosities. The essay does support the importance of "paying more attention to the ways in which phenomena and problems of interest are identified." That points to the understudied issue of asking questions, not of clarification, but questions that advance collective knowledge. Second, more critically than the methodologies, disciplines seek different evidence to support their contentions. However, there is a higher plane on which every discipline shares common ground: Every discipline is about finding, describing, and explaining patterns or constellations amid apparent chaos, and in every discipline it is fair game to ask "How do you or we know that?" All disciplines

define what qualifies as evidence in moving the discipline (and, if applicable, related practice) forward. The differences are at the levels of specifics, not what any particular science does. By this definition, history is also a science. What is or not a "science" may be an accident of semantics. In French, "science" is any field of inquiry (e.g., *sciences de l'éducation*) and the laboratory or natural "sciences" do not exclusively claim to own the word. By the same metric, physics is a humanity; ask any ethicist or historian of science or warfare. We need to be careful not to get trapped by local use or meaning of words (Chichekian, Savard, & Shore, 2011).

Ambrose's essay purports that some disciplines are mechanistic or narrow in their foci and potential contributions. Perhaps, but that does not seem to be the main limitation on any discipline being able to benefit gifted education, some more, some less, at a given point in time. When governments are pondering the funding or mandating of gifted education, political science, economics (even if it, perhaps more than psychology, remains a *wannabe* science), and sociology might be more relevant to that task than to a teacher trying to scaffold students through very difficult concepts in any subject. On the latter, educational psychology and cognitive psychology might not be a bad investment. When school districts need to allocate finite funding, ethics, law, and philosophy might effectively drive important elements of the discourse. Several prominent physicists in Europe and North America (notably Jerrold Zacharrias of MIT and the Manhattan Projectm who led the creation of the post-Sputnik PSSC physics curriculum, and Noble Laureates Isadore Isaac Rabi of Columbia University, Max Lederman of Columbia and the University of Chicago and Director of the Fermi Laboratory, and Georges Charpak of l'École supérieure de physique et de chimie industrielles (ESPCI) in Paris and CERN in Switzerland), all concerned about learners developing sound scientific thinking, have had a major impact on promoting inquiry-based pedagogies in education (Chichekian et al., 2011). What constitutes defensible evidence in many disciplines and codisciplines (I apologize for inserting a neologism here) and knowing how we know what we know are more important. Should the audience be known to be resistant to evidence, then rhetoric and other fields might come to our rescue. The more these different views coalesce or cocontribute, the stronger will be each of the legs supporting the field.

## Points of uncertain agreement

I first thought that I was not sure I agreed in the abstract where I read "going beyond psychology and education to explore theory and research in other disciplines such as cultural anthropology, ethical philosophy, history, sociology, economics, and the philosophy of science." In general, yes, let's look beyond these two, but not push them off the table. Early-to-mid-20th-century psychometrics is probably no longer the best friend of gifted education, yet the essay extols the contributions of cognitive science. Cognitive science came from psychology and is a major contributor to educational psychology. Education in general and gifted education in particular are "talking the talk" but not fully "walking the talk" on contemporary psychological views of what high ability means. At the cognitive level, especially, it is increasingly defined theoretically in terms of developing expertise (Barfurth, Irving, Ritchie, & Shore, 2009; Shore & Kanevsky, 1993; Shore, 2000; Sternberg, 2000, 2001). "Becoming an expert in a domain takes considerable work so becoming sufficiently knowledgeable in multiple domains is exceedingly difficult," however, if we start with building respect for other disciplines and professions, not necessarily personally acquiring all their expertise, then, as the essay concludes, "in so doing, we can generate refinements that can expand and strengthen the conceptual frameworks for the field." I was fascinated that

mathematics was somewhat caricatured and its core not quite captured, and psychology (apart from cognitive science) robed in an early to mid-20th century cloak while celebrating cognitive psychological ideas, even though the following specific words were not used, for example, adaptive versus routine expertise (Hatano, 1988; Pelletier & Shore, 2003), distributed cognition (Perry, 2003), and social constructivism (Vygotsky, 1978), that are especially espoused by psychologists in education. Theory leaped ahead decades ago, but policy and practice are the IQ-driven conceptual burden.

The essay also omits some interesting disciplines or fields of study such as psychobiology and medicine. Medicine has pioneered work in interprofessionalism (Herbert, 2005) that should resonate powerfully with gifted education. Healthcare teams are increasingly focused on interprofessional respect and knowledge in decision making. Physicians, nurses, social workers, physiotherapists, speech therapists, and psychologists, among others, contribute to creating care plans and making decisions, for example, about hospital discharge, because this process leads to better decisions in terms of patient outcomes. In a number of conference presentations in the 1980s, Gallagher described how a many-disciplined (I do not know if they were multi-, inter-, trans-, co- . . .) team of teachers, curriculum designers, and subject-matter specialists collaborated to create gifted-education curriculum units than none could have accomplished alone. How individuals and groups ask questions and how they make decisions are addressed in psychology, and other disciplines, and it is an important part of gifted education.

I am uneasy (perhaps indicative of the success of the essay in being provocative) about statements such as concern that "less precise fields" do not succumb to "an obsessive pursuit of mechanistic empiricism while marginalizing all other forms of scholarship." I am not convinced by the idea that some fields are more or less precise. Some ask more general or more specific questions at different times and places, but mathematicians do not place precision at the heart of their discipline. Rather, they rejoice in elegance. How precise is that? Cosmologists and particle physicists are as much in awe of the existence and nature of the universe as theologians and poets. Education and psychology have increasingly embraced qualitative and mixed methodologies from other social sciences because they offer explanatory power at different levels than probabilistic statements with statistical evidence. But "mechanistic empiricism" is a rather incomplete characterization of quantitative research. Is it because "psychology craves recognition as a science"? Perhaps it did a half century ago. Now it is rather secure in that status. A science of psychology grew out of 19th century natural philosophy, and cognitive science cited earlier in the essay as a positive contributor to our understanding of high ability is neither essentially mechanical in its empiricism nor yet very precise about every issue it addresses. The essay later acknowledges that "inquiry in mathematics and the natural sciences is much less certain, precise, and bound to logic than most believe." All disciplines, not only "mathematics and the natural sciences require investigators to embrace ambiguity, paradox, and aesthetics." Barron (1958) provided related psychological evidence about tolerance for ambiguity as a key part of creativity.

So does gifted education have "discipline envy? Does our field excessively strive to emulate the natural sciences?" Maybe the opposite. By pretending it is a discipline and not a field of application informed by many disciplines it has spawned adisciplinary programs and practices, fruit-baskets of whatever was on the shelves or "on special" that decade. It is not the lack of theory that hampers gifted education; it is the failure to embrace disciplinary thinking (and that includes the inter-, multi-, and trans-, and co- . . .). The example was offered of "one of the advantages of anthropology as a scholarly enterprise is that no one,

including its practitioners, quite knows exactly what it is." Yet anthropology has contributed important qualitative and mixed methods to education and psychology, and broadened notions of what constitutes evidence. Would a discipline with just one exact definition evolve and spawn new links with other fields or subdisciplines into full-blown disciplines of their own? Is it, therefore a problem if "gifted education" does not have a single definition? It does not bother me. I am less interested in how a field defines itself than in the questions it asks, what is considered valid evidence, and the means (plural) by which knowledge advances, whether indigenous or borrowed. Those qualities can be shared. Maybe we should be careful in gifted education not to simultaneously complain about being too precise then lament imprecision.

I was also puzzled by reaching out for new jargon. What is the attraction of "*modularized microexpertise* from many individuals, each of whom possesses one or a few small pieces of an intellectual puzzle" when the learning sciences, a close relative of cognitive psychology, has decades earlier given us the expression "distributed cognition." This topic also links well to interprofessionalism. The essay asked, "If gifted education aspires to be more scientific, . . . might it be better if those aspirations align with new, emerging, interdisciplinary-international trends in the natural sciences than with the more insular, silo-bound mid-20th century version of scientific work?" Mid-20th century was a long time ago in scientific terms. But one problem is that too much gifted education practice is based on polished 19th-century disciplinary concerns and questions, let alone 20th. Fortunately, by chance or design, scholarship in gifted education has been ahead of the curve in promoting (if not always practicing) inquiry-based, social-constructivist education. Yet, the core theoretical ideas of social constructivism were articulated in the 1930s by Soviet psychologist, Lev Vygotsky (1978).

## The take-home message

I am delighted that Don Ambrose's essay argues strongly for gifted education to pay close attention and form strong partnerships with disciplines and the bridges between disciplines. The vision resembles a concept map, not just the individual concepts, but also the richness of the links among them.

However, parts of this essay, perhaps for rhetorical reasons, appear to argue that psychology in particular has dominated the scene in gifted education. I do not think it is a zero-sum game; other disciplines and combinations of disciplines have already made contributions to gifted education.

I also challenge the notion that the problem lies within the disciplines themselves, or their theoretical foundations. I would like our field to consider that the problem is being adisciplinary, not having selected or being dominated by too few or inappropriate disciplines. If we consider education to be analogous to engineering as applied science and mathematics, to medicine (at least physical medicine) as applied biological sciences (of course it has added much more in recent decades), and therefore to be a field of applied practice, then we can think of gifted education as a specialization within the professional field of education. That is not a new proposal, but it supports the idea that gifted education should not itself become an aspiring science. To be a specialized area of professional practice, gifted education needs the benefit of every potential contributing area of theory and scholarship to provide its curiosities, concepts, theories, methodologies, evidential practices, and standards. Gifted education must borrow from many disciplines, and not favor one over another. Indeed, when disciplines engage with each other at their boundaries, everyone benefits.

"Should the field of gifted education reach beyond its own borders to engage in more interdisciplinary work?" Yes! A first challenge is to encourage gifted education to take disciplines, individually and the links among them, more seriously, and to go beyond the concepts and the methodologies by observing what it means to be curious in that area of study, how are original questions created, and what are the types and roles of evidence in advancing knowledge and practice? These processes are common to inquiry in every field, and also essential to learning and instruction in the 21st century. If gifted education made such a move, it might overcome some of its isolation. To borrow a line from the ancient scholar, Hillel, "all the rest is commentary."

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**Commentary (8):**

# Gifted Education and Conditions for Interdisciplinarity

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## Abstract

The increasing complexity of the modern world is compelling many fields to engage in interdisciplinary endeavors. Gifted education should be no different; however, efforts to date have been modest. This article presents a structure from which to gauge the current level of interdisciplinary involvement in gifted education from individuals importing different disciplinary paradigms to projects that involve the perspectives of many different fields. Criteria are presented to help determine whether gifted education has the structural elements in place to support interdisciplinary work. Finally, a set of pragmatic ideas is presented to support further interdisciplinary involvement.

**Keywords:** Gifted; interdisciplinary; policy.

> *In the knowledge economy, it is often the case that the right knowledge to solve a problem is in a different place to the problem itself, so interdisciplinary innovation is an essential tool for the future. There are also many problems today that need more than one kind of knowledge to solve them, so interdisciplinary innovation is also an essential tool for the challenging problems of today*. (Blackwell, Wilson, Street, Boulton, & Knell, 2009, p. 3)

The National Academy of Science identifies four forces that are driving the traditional disciplines towards interdisciplinary investigation: The inherent complexity of the natural and human made world; the desire to explore real-world complex problems; the desire to resolve societal problems; and the rapid development of new technologies (National Research Council, 2004). These forces propel academic disciplines together, causing collisions of ideas and revolutions of thought within and across fields of study. Nowhere is this more evident than in the sciences, where:

> … it is required that the most expert and sophisticated minds be capable of changing those minds, often with a great lurch…The next week's issue of any scientific journal can turn a whole field upside down, shaking out any number of immutable ideas and installing new bodies of dogma, and this is happening all the time. It is almost an everyday event. (Thomas, 1998, p. 689)

Examples of "lurches" in scientific understanding are easy to find. A notable example is the paradigm-shifting work of the Human Genome Project (HGP), which began as collaboration between the US National Institutes of Health and the Department of Energy. Not only did the work of the HGP transform our understanding of medicine, it has had a widespread multiplier effect, impacting fields as diverse as renewable energy, biotechnology, agriculture, animal medicine, forensics, ecology, anthropology, and homeland security. Interdisciplinary ventures don't have to be large to have substantial impact: in the AncientBiotics project, a microbiologist teamed with an Anglo-Saxon scholar and found a

promising treatment for the Methicillin-resistant Staphylococcus aureus (MRSA) virus in ancient texts (Healey, 2015).

Gifted education also encompasses numerous complex issues associated with physiology (brain and body development), psychology (finding human fulfillment), sociology (impact of class structure on ability), economics (societal wants and needs, short- and long- term investment), and politics (the definition of equal opportunity). Ambrose outlines the advantages to be accrued from interdisciplinary investigation of gifted education by integrating these perspectives and also the disadvantages of failing to engage. He poses questions about our collective will to change our established ways of thinking when confronted with alternate views on giftedness, intelligence, ability, creativity, and talent. Ambrose urges us to pursue new ideas and grapple with their attendant challenges, much as J. Gallagher (2000) advised us to consider so-called unthinkable thoughts.

Yet there is really little to debate in the question "Should we engage in interdisciplinary reasoning?" The answer is self-evident: yes. Ambrose focuses on the benefits of expanding the field's conceptual underpinnings and strengthening its research base. The benefits of interdisciplinary engagement extend beyond philosophical structures to practice-oriented dimensions of the field. Many years ago J. Gallagher (1998) cautioned that "education, alone, is a weak treatment" suggesting that the goal of supporting the extraordinary ability of gifted youth will only succeed if it is viewed from a broader multidisciplinary perspective.

A more ambiguous question is "If interdisciplinary collaboration is desirable, why aren't we more deeply engaged?" Ambrose cautions that in the absence of outside insights we could become dogmatic, stuck or limited in our thinking, yet he also notes that the field has many interdisciplinary thinkers. This acknowledgement suggests that many already possess the proper cast of mind and that other factors may impede our progress into an interdisciplinary arena, including some that are more pragmatic than philosophical. This response considers the current structure of gifted education, presents a scheme for classifying levels interdisciplinary engagement, and assesses current interdisciplinary ventures according to this scheme. The article will then turn to factors that create barriers to significant, far-reaching interdisciplinary engagement, and presents ideas for moving forward.

## Gifted education as a hybrid field

Like cultural anthropology, gifted education is a pragmatic, practice-based field with many facets. To that extent gifted education is already a hybrid, a field that draws from many different disciplines to form its core knowledge and practices (Epstein, 2003). Degree programs in gifted education are housed within a number of different specialties, including special education, curriculum and instruction, educational leadership, educational psychology, and counseling psychology; there are few freestanding "departments of gifted education" in higher education. As a result the disciplinary territory that defines "gifted education" already has blurry boundaries. This ambiguity calls into question whether gifted education even qualifies as a "discipline" *per se* and creates some identity confusion as we implicitly struggle with, for example, the degree to which we are a part of special education or general education. The amorphous boundaries also give gifted education an excellent foundation for cross-disciplinary interaction. Indeed, the fluid nature of the field makes some intra-disciplinary boundary crossing nearly invisible, as when a professional with degrees in psychology and special education acquires a professional identity as a curriculum specialist.

Gifted education is also still relatively young and small compared to many disciplines. In the US, significant growth and stability occurred only after 1972 when the Marland Report created a catalyst for the development of statewide programs. Important work was conducted before that time (Henry, 1958; Hollingworth, 1942; Terman, 1926; Witty & Jenkins, 1935) , but, as a whole, the field was substantially smaller and more loosely organized. At that point in time an expert in gifted education was expected to be a generalist; today, a larger group of professionals feels free to develop pockets of expertise in topics such as twice exceptional, social-emotional needs, measurement of intelligence, or curriculum.

The diverse fields associated with the gifted education approach questions with different paradigms of thought, and even this level of intra-disciplinary diversity creates intellectual tension around pivotal questions, including the very nature of giftedness and the aims of the field (McBee, McCoach, Peters & Matthews, 2011; Subotnik, Olszewski – Kubulius, & Worrell, 2011). One of the most pervasive issues is an apparent dichotomy between perceiving giftedness as "who you are" (what some might term "genetic orientation") or giftedness as "what you do" (what some might term "achievement orientation"). While these don't really rise to the level of metaphor, these different paradigms are powerfully influential, as they lead to different notions as to how to identify, serve, and support gifted students, and also the nature of a desirable outcome. It is easy to see how an injection of new points of view could help move this and other intellectual stalemates into productive new territory.

Even though there are many clear advantages to interdisciplinary engagement, and even though gifted education has a multidisciplinary structure and blurry boundaries, there have been few substantial interdisciplinary efforts that focus on or involve gifted education. A structured look at different types of interdisciplinary work may reveal new insight into patterns of engagement, or lack of engagement, and help identify ways to move forward.

## Four levels of interdisciplinary engagement

Assessing the extent and nature of interdisciplinary work in gifted education requires a framework defining varying degrees of interdisciplinary immersion. Klein (1996) describes interdisciplinary engagement according to a four level hierarchy. The first and most cursory level of interaction is *sharing* background or content knowledge across fields, where professionals from one discipline or sub-discipline crosses into a different area to either share or borrow ideas. Activity at this level would include publishing an article or making a conference presentation that combines disciplinary perspectives without an expectation of ongoing work. The term *multidisciplinary* is also used to describe sharing across disciplines that, "draws on knowledge from different disciplines but stays within their boundaries" (Choi & Pak, 2006, p. 359). The second level, *elaborating*, occurs when a professional from one discipline comments on the work of another field. Examples include when an external expert is asked to serve as a discussant on a panel, write an explication in an introduction of a book, or provide a critical analysis of a research study from another field. As with first-level sharing, elaborating does not require an ongoing relationship or a change in the structure of a discipline. At the third level, *collaboration*, professionals from various fields work together to create mutually acceptable definitions of important themes, variables, research questions, or categories of study; however, they stop short of working together to explore those ideas. Others refer to this as *interdisciplinary* interaction that "analyzes, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole." (Choi & Pak, 2006, p. 359). An example would be a collaboratively planned, co-sponsored, invited conference to develop policy recommendations or research questions around a specific topic. The highest

level of Klein's hierarchy is *blending*, where an interdisciplinary team engages in a creative merging of programming, research, analysis, and/or interpretation of information. Blending is also sometimes known as *transdisciplinary* work where subjects are integrated in the service of solving a complex problem, and the resulting knowledge transcends traditional boundaries (Choi & Pak, 2006). When blending goes on for an extended time, a hybrid discipline may be formed. Over time, hybrids can transform into recognized disciplines. The four levels of Klein's scheme, their definitions, and examples are presented in Table 1.

**Table 1:** The four levels of Klein's scheme, their definitions, and examples.

| Interdisciplinary Structure | Information Accrual | Description | Hypothetical Example in Gifted Education |
|---|---|---|---|
| Sharing | Additive | Outside expert provides information completely separate from and independent of others | An expert in gifted education writes the forward of a book that is authored by a sociologist. |
| Elaborating | Additive | Expert from another discipline provides an in-depth interpretation of data or phenomena | Someone from a prestigious testing service is invited to contribute a chapter that gives an alternate interpretation of achievement trends among high ability/low-income students. |
| Collaborating | Modestly Integrative/ Transformative | Experts from a variety of fields participate in identifying key variables | A think-tank conference comprised of educators, psychologists, physicians, and policy makers define the variables associated with effective intervention for twice exceptional students. |
| Blending | Substantially Integrative/ Transformative | Experts from different fields actively collaborate and join knowledge, methods, and theories to add to practice | Neurologists, general educators, gifted educators, social workers, and psychologists form a team of investigators in a study of the multifaceted impact of poverty on children born with high intellectual potential. |

## Bridging gifted education and outside disciplines

The first two levels of Klein's hierarchy, *sharing* and *elaborating*, could be considered 'disciplinary bridging', where professionals in one discipline briefly step across the boundaries of their fields in order to either import or share information, methods, theories, or practices, and then step back again. This form of interdisciplinary work does not require massive budgets or large teams; it only requires an individual who is sufficiently knowledgeable in more than one field, and who has the requisite habits of mind and a mature epistemology (S. Gallagher, 1998, 2014; Hofer & Pintrich, 2002; King & Kitchener, 2002).

Professionals in gifted education appear to be active in both intellectual and pragmatic interdisciplinary bridging. Ambrose's body of work demonstrates how an individual working alone can import a paradigm from an outside field to gain new perspective on issues. Experts from ancillary fields also occasionally appear in gifted education either by invitation (J. Cross & Borland, 2013; Hodgkinson, 2007) or on their own, pursuing individual interests (Winner, 1997).

Other leaders in gifted education have crossed the boundaries of our field to export information outside of our relatively small circle. They have published articles about gifted children in other areas of education and psychology (Callahan, 2001; Delisle, 2015; J. Gallagher, 1982, 1995; S. Gallagher, 1989, 1998, 2000; Gallagher & Gallagher, 2013;

Grantham & Ford, 2003; Landrum, 2001; Renzulli, 2011), and have occasionally organized special issues of journals outside of gifted education in order to bring the needs of gifted students to the attention of different audiences (Colangelo and Wood, 2015; Plucker, 1998; Renzulli, 2002; Seon-Young & Olszewski -Kubulius, 2015). Concerted efforts have also been made to import relevant research from psychology and special education into the field (Coleman & Johnson, 2013; Subotnik, Olszewski –Kubulius, & Worrell, 2011; S. Gallagher, 2012). There are also examples of efforts to bridge to more distant fields: recently, the organization Supporting Emotional Needs of the Gifted (SENG) worked with the American Academy of Pediatrics to increase awareness of the needs of twice-exceptional students.

Curriculum efforts in gifted education have also bridged disciplines. Curriculum models developed outside of gifted education have been adapted for use with gifted students (S. Gallagher, 2014a; S. Gallagher & J. Gallagher, 2015; Van Tassel-Baska & Little, 2011) and interdisciplinary expert-practitioner models have been used successfully to create curriculum (J. Gallagher, Oglesby, Stern, Caplow, Courtright, Fulton, Guiton, & Langenbach, 1982; Van Tassel-Baska, S. Gallagher, Bailey & Sher, 1993). The resource consultation and Response to Intervention (RtI) models used in many gifted programs were originally designed for special education (Coleman & Johnson, 2013; Landrum, 2001). Tomlinson's work on differentiation, now widely accepted in general education, was first introduced in gifted education (1995). All of this interdisciplinary work has great value, adding to the body of disciplinary knowledge, creating helpful relationships, and setting the stage for more integrated work.

Despite its value, interdisciplinary bridging rarely causes the "lurches" in insight that occurs when a microbiologist works side-by-side with an expert in ancient languages. Most of the work conducted at these first two levels represent individuals or small groups working within-field, not interdisciplinary collaborations, and as Klein cautions, there is a difference between simply working with different people to broaden one's scope and true interdisciplinary, integrative thinking (Klein, 2010).

The higher levels of Klein's (2010) scheme entail active professional collaboration as well as the import and export of intellectual ideas; there is much less work related to gifted education that qualifies for these higher levels. To some extent this is natural; the first two levels of Klein's (2010) scheme are easier psychologically, philosophically, and logistically.

## Cross-disciplinary collaboration and blending in gifted education.

Cross-disciplinary collaboration entails professionals from different fields joining together to refine concepts, define problems, form research agendas, or craft policy recommendations. There are only a few examples of projects where experts outside of gifted education apply their knowledge and skills in collaboration with experts in gifted education. For the most part they take the form of invited conferences on specific topics, typically mathematics and science (Dreyden, S. Gallagher, Stanley, & Sawyer, 1988; National Research Council, 2002) and the needs of traditionally underrepresented students (Donovan & C. Cross, 2002; J. Gallagher, 1974; VanTassel-Baska & Stambaugh, 2007). Most of these conferences were organized within-field, so they may not even fit the definition of authentic interdisciplinary collaboration, and in each case their effect was fleeting. Gallagher's (1974) conference on culturally different gifted children reached furthest, including representatives from special education, science education, public policy, and public television, yet even this effort had limited impact relative to the possible influence of the participants, suggesting that *collaboration* is most effective when it leads to subsequent *blended* efforts.

One possible example of blending is the current effort by a diverse group of education agencies to form a Community of Practice (CoP) around the needs of twice- exceptional students. The twice-exceptional CoP is an ongoing collaboration of professionals from fields of gifted education, learning disabilities, special education, and psychology; it has already created an inter-agency endorsed definition of twice-exceptionality (Coleman & Roberts, 2015). This forward-thinking collaborative is a positive development regardless of its interdisciplinary level; however, whether it meets the criteria for transdisciplinary 'blending' depends on how one draws the boundaries that distinguish the territory around and among gifted education, special education, and psychology.

## Conditions that facilitate interdisciplinary collaboration

A field with permeable boundaries and a real-world base of practice would seem perfectly positioned for immersion in interdisciplinary investigation, yet most interdisciplinary work has been characterized by individuals engaging in short-term bridging across fields. Why? Ambrose's focus is primarily on some of the philosophical and psychological barriers that may prevent in-depth interdisciplinary work. These are critical, but other barriers must also be breached if more substantial interdisciplinarity is to find a foothold in gifted education. A qualitative shift in the nature of interdisciplinary interaction occurs between Klein's stages 2 and 3, because stages 3 and 4 require more than knowledge and epistemological maturity. The higher levels of Klein's scheme require active collaboration of professionals in different fields, entailing more complex logistical structures. After surveying 25 interdisciplinary programs, McCoy & Gardner (2012) identified five key questions to answer prior to embarking on interdisciplinary studies, none of which related (directly) to knowledge or philosophy: 1) Do you have enough time?; 2) Do you have the right people?; 3) Do you have the right departments (organizational structure)?; 4) Do you have the right policies?; and 5) Do you have sufficient resources? These five questions can be collapsed into two principal needs: 1) a *critical mass* of professionals; and 2) adequate *capital*.

## Critical mass

Interdisciplinary investigations often begin with the recognition of gaps in knowledge or overlapping interest across two or more fields; either of these can lead to Ambrose's 'edge of chaos'. Gaps between subjects are particularly productive territory, for as interdisciplinary beacon Norbert Weiner noted, "Change comes most of all from the unvisited no-man's land between the disciplines" (Weiner, in Burke, 2007, p. ix). Gaps are also the source of tremendous creative potential. Torrance noted that creativity is, "the process of sensing …problems, gaps in information, missing elements…" (1988, p. 47). The open space of a knowledge gap is also inherently ill-structured, inviting the kind of epistemological pluralism that Ambrose advocates.

Conversely, gaps in knowledge can be identified as a result of specialization, the result of drilling down in the knowledge base until new questions are formed. Such specialization is also a catalyst of interdisciplinary collaboration and even new hybrid fields, as Øestreng (2007) explains:

> hybridization…takes place because specialization leaves gaps between disciplines and specialties and those gaps have to be filled. This gap-filling process creates hybrid disciplines or multidisciplinary disciplines, i.e., a conglomerate of specialties sharing a common focus and/or object of interest or study (pp. 12-13).

The field of gifted education was originally formed in response to just such a gap between knowledge and services.

Overlaps between two disciplines occur when the knowledge base of a field grows so large that it reaches beyond its established boundaries. Perhaps one of the most influential examples of expanding out is the move in general education over the past two decades to include a greater emphasis on higher-order thinking, creating an overlap with interests in gifted education. Another example of different fields expanding into similar territory is the current interest across personality psychology, neuropsychology and gifted education in the exploration of the relationship between Openness to Experience and intelligence (S. Gallagher, 2012; Kauffman, 2013; Limont, Dreszer-Drogorob, Bedynska, Sliwinska, & Jastrzebska, 2014; Schretlen, van der Hulst, Pearlson, & Gordon, 2010; VanTassel-Baska, 2012). Expanding can also take the field to the frontiers of knowledge where contemporary Galileos present ideas so new and original they force reconsideration of the line between the possible and the improbable.

Filling gaps and exploring edges each require a critical mass of professionals, some who maintain the core of the field while others push boundaries or explore specific issues in depth. As previously mentioned, it is possible that we are only now reaching a numerical tipping point with enough professionals for some to maintain the core while others focus on gaps. It is easy to imagine a topic like high-functioning autism could attract a collective of gifted educators, physicians, neurologists, special educators, or psychologists to form a specific sub-discipline. Critical mass is also essential to ensure that new ideas have an audience.

Even then many professionals only experience the critical mass at conferences. In daily life at the university faculty in gifted education often work on their own; those individuals are often responsible for teaching licensure sequences in addition to research and service responsibilities, a sizable work load leaving little time to acquire cross-disciplinary knowledge or form relationships.

## Four forms of capital

A field needs more than a critical mass of like-minded professionals to engage in interdisciplinary efforts, it also requires four distinct kinds of capital: social, economic, symbolic, and cultural (Klein, 1995). Together these address the people needed to carry out interdisciplinary work, funds to support the work, cultural importance to justify the work, and meaningful products resulting from the work.

a. **Social capital**. Social capital refers to enduring professional relationships and networks. Social capital is easiest to acquire because it can be cultivated on an individual level through formal or informal interaction. In general, social capital creates interest and an advocacy base, but does not generate substantial change. While there are exceptions to any rule, social capital must usually be combined with some economic capital to create interdisciplinary activity. Social capital exists at many levels including both a cadre of like-minded colleagues who work together and an equally essential support team, often at a higher administrative level, who can affect organizational structures and shift resource allocation.
b. **Economic capital.** Although money is the primary component of economic capital, other resources such as time, space, and materials could be included in this category. Social and economic capital can operate independently of symbolic and cultural capital, but only on

relatively small initiatives. Regardless of its form, most interdisciplinary initiatives are dependent on at least some economic capital.

c. **Symbolic capital.** Symbolic capital is the status of a field or ideas within a field (Dalpiaz, Rindova, & Ravasi, 2010), as such, symbolic capital either reflects existing cultural priorities or capital is created by persuading the current culture that an issue or idea is important. Because symbolic capital is abstract it cannot generate interdisciplinary activity on its own but it plays a vital role in attracting attention of professionals from other fields (social capital) and funding (economic capital).
d. **Cultural capital.** Social, economic and symbolic capital can be *acquired* but cultural capital must be *produced*. Cultural capital refers to the significance of the ideas, tools, and skills held or produced by a field; when these are important cultural capital contribute to symbolic capital. Conversely, having symbolic capital makes it easier to draw the public's attention to a field's cultural capital.

As indicated above, small efforts, mostly comprised of multidisciplinary bridging, are possible with only social and modest economic capital. Substantial interdisciplinary efforts require all four forms of capital working together, as depicted in Figure 1.

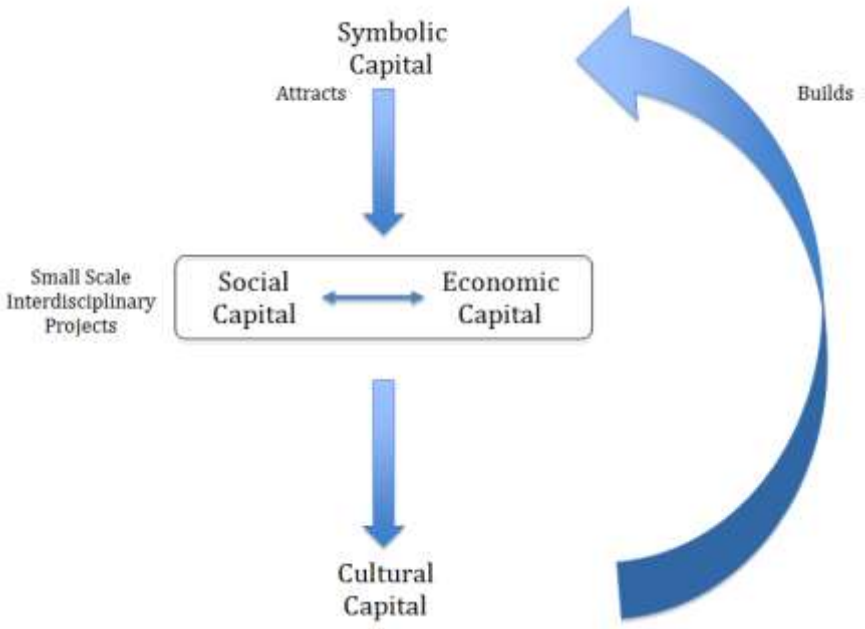


**Figure 1:** Interaction of four types of capital.

## Capital in gifted education

Gifted education is slowly acquiring greater social capital as the professional base grows and networks expand; however, the field has struggled to acquire or produce economic, symbolic, or cultural capital; these deficits create significant barriers to interdisciplinary collaboration.

a. Symbolic capital. Symbolic capital is pivotal to garnering economic and social capital. Gifted education's lack of symbolic capital is ironic, given reports of an impending leadership gap (Lee, 2009; McDonagh, Bobrowski, Hoss, Paris & Schulte, 2014). Repeated attempts to link gifted education with larger concerns such as social equity (J. Gallagher, 1995; VanTassel-Baska & Stambaugh, 2007) and national wellbeing (J. Gallagher, 2013) have failed to remedy the situation. The most significant emblem of this

lack of symbolic capital is the ongoing need for large-scale policies that translate philosophical support for gifted children to pragmatic, actualized support. Policies articulate a society's priorities and carry inherent symbolic capital; policies are also used to attract and allocate economic capital (J. Gallagher, 1994). Strong public policies supporting the development of advanced human capital around the world remains the cornerstone to achieving many goals on behalf of gifted children, including attracting interest in and resources for interdisciplinary endeavors.

b. Economic capital. Substantial interdisciplinary work requires an economic foundation. It is hard to attract scholars from outside fields for any length of time in the absence of financial support. Gifted education remains among the most underfunded corners of public education in the United States. Even in the post-Sputnik era of the 1960s and 1970s, which saw unprecedented research and development into curricula for gifted students under the National Defense Education Act, the funds went to scientists, social scientists, and curriculum specialists, not to experts in gifted education—gifted education barely existed as a 'field' at that point.

   Gifted education in the US has relied on acquiring economic capital by focusing on issues where our interests converge with social needs that hold inherent symbolic capital, especially the needs of children in poverty. The interdisciplinary conference that produced *Talent Delayed, Talent Denied* (J. Gallagher, 1974) was funded by The Robert Sterling Clark Foundation because of its priority on identifying the multi-faceted needs of low-income students. The current Jacob K. Javits Gifted and Talented Act shares this orientation. This is a perfect example of how gifted education makes use of the symbolic status of a related issue to acquire symbolic capital, of how economic capital flows directly from that symbolic capital, and how both can influence the focus of work in a field.

c. Cultural capital. The products resulting from research and development in gifted education are curriculum, instructional methods, and knowledge about individuals with advanced abilities. For the most part the cultural capital produced addresses the specific needs of gifted students, although efforts have been made to bridge curricula and methods with general education. The recent emphasis on high ability-low income students has yielded valuable information about the needs of some students in poverty; however, they are not widely acknowledged outside the field.

## A "Capital Campaign" to increase interdisciplinary efforts

When members of a civic organization want a new building, they engage in a capital campaign, a fund-raising effort to solicit the money needed for construction. Developing interest in substantial interdisciplinary efforts in giftedness may require a "capital campaign" to develop the field's capital. At the largest level are long-term goals to persuade governments and foundations of the benefits of ensuring that gifted students fulfill their potential as professionals and responsible human beings. However, numerous smaller steps could also produce increased capital. These efforts do not have to reside in higher education; in fact, many are more appropriately undertaken by individuals and advocacy organizations.

## Acknowledging efforts

One step towards encouraging more interdisciplinary interaction is simply to acknowledge and celebrate current efforts. It would be relatively easy to invite authors to send the titles of out-of-field publications to a gifted education journal where they could be listed quarterly. Organizations could create awards or certificates of recognition for these efforts to acknowledge the extra effort entailed in reaching an out-of-field audience. Journals

could also highlight research about the giftedness, creativity, and intelligence to raise awareness of individuals outside of the field who might become interdisciplinary collaborators.

## Creating interdisciplinary space

Interdisciplinary thinking is easier to foster when professionals in different fields share space; proximity and familiarity each help foster social capital. Structuring physical space to intentionally produce causal interdisciplinary encounters is an effective way of sparking ideas (Catmull & Wallace, 2014; Wierzbicki & Nakamori, 2006). Traditionally, colleges and universities have organized spaces for interdisciplinary research and development; external organizations can also take the lead in creating space for interdisciplinary thinking. This is especially true with the advent of technologies that allow for the construction of a virtual interdisciplinary think-tank. The following list of ideas for creating interdisciplinary space includes opportunities both for universities and other organizing structures in the field.

### (1) Interdisciplinary post-graduate fellowships

Cultivating interdisciplinary habits of mind early in professional careers is integral to building interdisciplinary initiatives. One model of an education-based interdisciplinary think-tank/training-ground is the Bush Institutes for Child and Family Policy. The Archibald Granville Bush Foundation provided the economic capital for four Bush Institutes at universities around the US, each center awarded post-doctoral fellowships to professionals from a variety of backgrounds to develop interest and capacity in child and family policy. Led by interdisciplinary teams of experts, the fellowships were considered extremely prestigious (symbolic capital) and were well populated (social capital). The cross-fertilization created a network of educators and policy analysts who invested in the lives of children and families. Although the four sites no longer exist as Bush Institutes, at least two of the four have transformed into ongoing ventures supporting interdisciplinary perspectives on children and families. A university or organization could sponsor young professional seminars on campus or on-line to attract the attention of new scholars from different fields to the needs of gifted children.

### (2) Interdisciplinary Programs of Study in Gifted Education

Another natural alternative is to develop interdisciplinary programs of study in gifted education. Often gifted education is the sole purview of an education department, but it is easy to imagine how an interdisciplinary menu of courses could be organized for students whose interest in giftedness extends beyond the classroom. Many precedents for interdisciplinary studies programs exist; one example comes from the National Science Foundation (NSF), which counts among its Grand Challenges the need for interdisciplinary training. Program planners at NSF responded with a venture called Interdisciplinary Graduate Student Training (IGERT), designed to catalyze a change in culture in graduate education for all involved and to create a new landscape for interdisciplinary research (IGERT, 2015).

### (3) Co-sponsored conferences

Efforts have been made to invite out-of-field speakers to invited conferences in gifted education, but there have been few conference that are collaboratively planned and executed with organizations outside of gifted education, with resulting reports and products co-owned by all organizing agencies. Co-sponsored conferences could be developed in collaboration with groups with vested interests in the nature of intelligence, gender equity in education, the

sociology of achievement, and so on. A co-designed, co-sponsored conference between gifted educators and Title 1 educators that could also include a diverse array of psychologists, sociologists, policy analysts, and even nutritionists would seem a natural place to start, as would an interdisciplinary conference on advanced intelligence in childhood.

**(4) Publications and online venues**

Another way to attract interest and participation is through interdisciplinary journals. While most journals would undoubtedly welcome manuscripts that blend different perspectives, it is not the current norm. A new or reorganized journal with an interdisciplinary editorial board that included sections dedicated to both multidisciplinary and interdisciplinary offerings could inform current debates, provide ideas for interventions, and shift the research landscape.

**(5) Webinars**

Webinars could also be used to introduce new, interdisciplinary viewpoints to the field of gifted education, with an eye to developing interdisciplinary initiatives. Similarly, listservs, blogs, and chatrooms and other social media formats could be used to attract a diverse group of interested parties to a particular topic. Over time these online forums could become a place for facilitated workshops where interdisciplinary projects are conceived and designed, much as the University of Dundee (in Scotland, UK) has created time and space for planning and designing interdisciplinary collaborations between animators and physicians, jewelers and anatomists, lawyers and energy policy experts (Blackwell, Wilson, Street, Boulton, & Knell, 2009).

**(6) Centers.**

The largest-scale example of a physical venue dedicated to research on a topic is a research center. A chief example of an interdisciplinary center in education is the Frank Porter Graham Child Development Institute (FPG) at the University of North Carolina, US. The FPGCD Institute started as a typical child development center but rose to international prominence as a locus of interdisciplinary research on children and families. Vital to the success of the venture was the wide scope embraced in the center's mission. It does not focus on schooling *per se* but on child development at home, at school, and at play. The whole-child orientation allowed center leadership to attract sociologists, pediatricians, policy analysts, and specialists from other fields.

The field would benefit from formation of, or association with, more research or technical assistance centers of this sort, but the question of long-term alliances may force a new kind of reflection on the definition of the field. Because efforts have traditionally focused on children, our aims have typically focused on education, and to a lesser extent on parenting and personal adjustment. A redefinition of the field that makes education one branch of a larger investigation on the development of extraordinary ability in all dimensions, across environments, and throughout the lifespan may attract the interests of a wider variety of researchers.

**(7) Defining concepts and problems.**

Complex problems are common sources interdisciplinary inquiry. Experts from diverse fields are often drawn to the same problem and form collaborations that end when the project is complete. Gifted education is invested in many issues that are of interest to the public at large including achievement and income, STEM leadership, twice- exceptionality,

the waste of human potential, gender and racial equity, and cultivation of leadership for 21st century societies. More specific topics that would still draw interdisciplinary interest include intelligence, creativity, human development, neurochemistry, and personality theory. Physical or virtual seminars comprised of an interdisciplinary panel could set out to define problems, to discuss different approaches to solving the problem and to consider the impact of different solution options. Ideally, these would lead to projects that would take the field into new territory.

## Consequences of change

The prospect of increased interdiscplinarity is exciting. As Jerome Bruner (in Thompson & Laird, 2004) noted years ago, it is possible to become so familiar with our own assumptions we no longer even recognize them, just as a fish fails to recognize the water:

> there's an old proverb which says… "The fish will be the last to discover water" and generally speaking you know it's true. You live in a medium you're not conscious of it--you need a little bit of contrast. ...the fish jumping out of water and discovering, "Hey, I've been in water!" (Bruner, in Thompson & Laird, 2004).

There has always been a degree of interdisciplinary engagement bridging to other fields, but for the most part it has not been the sort that forced a close look at the water in which we swim. It would be healthy to have our "immutable truths" considered from different points of view or investigated using different methodologies. Already, research is being conducted outside of gifted education could have tremendous bearing on how we conceptualize giftedness and ability, especially research in neurology where studies in brain development and structure (Jauk, Neubauer, Dunst, Fink, & Benedek, 2015; Shaw et al, 2006) and developed neural plasticity (Kolb & Gibb, 2011) are creating new twists in the nature-nurture debate.

Of course a fish out of water faces both opportunity and risk. We may find our body of water is smaller than we thought, or larger, or shaped differently. We may find it hard to breathe for a while as we are forced to reconsider what we currently take for granted, and learn to accept what seems outlandish. Information about intelligence, creativity, and giftedness is expanding in ancillary fields whether or not we choose to participate or even pay attention. At the very least we will have to continue to make concerted efforts to create bridges with other fields or we will become irrelevant. In the end, the benefits of interdisciplinary engagement far outweigh the risks. Not only do we gain new insights, there are extended advantages including a larger advocacy base and insight into how to make services more effective. In many ways the field is better positioned today than it has ever been to begin this new exploration. Given these realities, it is time to take the leap.

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## About the Author

**Shelagh A. Gallagher** has worked with gifted students, their teachers and their parents from Charlotte to Kazakhstan. Prior to her current role as consultant and curriculum writer, she spent 13 years leading the licensure and M.Ed. degree programs in the gifted education program at UNC Charlotte. Dr. Gallagher has also worked at the North Carolina School of Science and Mathematics (NCSSM) and the Illinois Mathematics and Science Academy (IMSA), two of the nation's premiere high schools for gifted students. After leaving IMSA, Dr. Gallagher became the first manager of the federal grant that produced the highly influential Problem-Based Learning science units from the William and Mary Center for Gifted Education; subsequently, she directed two federal grants that continued her research into PBL for gifted disadvantaged adolescents. Her work in this area continues today as lead consultant for Project ExCEL. Throughout her career, Shelagh has worked to expand the pool of available curriculum materials designed to challenge gifted students. She has published curriculum units in science, social studies and language arts. Seven of Dr. Gallagher's curriculum units have won the National Association for Gifted Children Curriculum Division Award for Outstanding Curriculum.

Shelagh has conducted research and published articles on topics including personality attributes and giftedness, developmental and academic needs of gifted adolescents, appropriate curriculum for gifted students, gender differences in mathematics performance, Problem-Based Learning and twice exceptional students. Every summer she works with gifted adolescents as a Fellow at the award-winning camp Yunasa. Shelagh served two terms on the Board of Directors of both NAGC and the North Carolina Association for the Gifted (NCAGT). She has received the Distinguished Service Award and the James J. Gallagher Award for Advocacy from NCAGT, the Provost's Award for Teaching Excellence from UNC Charlotte and the Article of the Year Award from NAGC. She is a contributing author in *Off the Charts*, winner of the 2013 Legacy Book Award from the Texas Association for the Gifted and Talented.

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**Commentary (9):**

# Commentary on Ambrose's Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundations for Gifted Education

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**Keywords:** Gifted education; Interdisciplinary.

Ambrose presents an evocative argument in his *Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundations for Gifted Education*. His goal of clarifying and strengthening the conceptual foundations of gifted education through the exploration of other disciplines encourages the field to remove some of the artificial parameters established, opting instead to seek out parallels and possibilities. His engaging format (including the effective use of questioning) readily draws the reader into his discussion. The reader pauses at the end of each section, asking himself how that idea corresponds to his own work and challenges him to make connections. This may be something as simple as looking at an economic impact study for a center for gifted studies or as complex as partnering with specialists in other fields for a research project. This article – and more importantly the charge for interdisciplinary and transdisciplinary studies – should not only appeal to those in gifted education, but it should also engage those in many other disciplines from economics to philosophy.

## About the Author

**Tracy Ford Inman**, *Ed.D.*, is associate director of The Center for Gifted Studies at Western Kentucky University and active on the state, national, and international levels in gifted education. She has taught English at the high school and collegiate levels, as well as in summer programs for gifted and talented youth. In addition to writing and cowriting several articles, Tracy has coauthored several books with Julia Roberts through Prufrock Press.

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**Commentary (10):**

# Interdisciplinary Perspectives to the Development of High Ability in the 21st Century

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## Abstract

Ambrose posits that gifted education is mired in the conceptual folds of psychology with dogmatic trends spilling into its application in educational settings. In particular he calls into question issues of socio-economic fairness, epistemological entrenchments within the discipline, and the need to adopt an interdisciplinary approach that can make it relevant for the 21st century. Arguments are proposed for interdisciplinary frameworks to help Gifted Education move beyond its existing theoretical status quo, and to make it relevant for the needs of 21st century societies. Other disciplines such as philosophy, economics, and sociology, which became encumbered in dogmatism were able to develop as a result of being open to conceptual frameworks from other disciplines that helped scholars rise above dogmatic quagmires (Ambrose, Sternberg, Sriraman, 2012). We discuss an interdisciplinary framework for talent development within the macro context of the changing needs of societies. More specifically we give examples of interdisciplinary work arising within mathematics and mathematics education that have freed these disciplines from their foundations in logic and psychology respectively.

**Keywords:** Interdisciplinary education; experimental mathematics; model eliciting activities; high ability; talent development; mathematics education; societal needs.

Idea borrowing from other disciplines is not a new phenomenon. For example, analytic philosophy draws on the foundations of logic whereas continental philosophy relies on hermeneutic frameworks; Economics which was initially dependent on mathematical methods used in the natural sciences as its foundational base has increasingly moved to sociology and evolutional psychology as a way to explain macro processes and human choices; Even physics which was anchored in the deterministic mechanical Newtonian universe underwent a subsequent paradigm shift towards the acceptance of relativity and probabilistic statements in quantum mechanics for the position of particles. Similarly statistics, which notes its birth in probability, influenced by Francis Bacon's re-conception of science, and traditionally Bayesian in its approach, has broadened its bases to accommodate frequentist and subjectivist views (Chernoff & Sriraman, 2014). This suggests that ideas from other disciplines play a major role in expanding boundaries and overcoming dogma (Ambrose, Sriraman, Pierce, 2014).

Human beings are by definition ''interdisciplinary''. We are complex neurobiological organisms capable of juggling a wide array of tasks that intertwine the physical, psychological, inter-personal, intuitional, intellectual, cultural, and spiritual dimensions of

being. Moreover, issues humanity faces such as climate change, health, environment, overpopulation, and so on are so complex that these problems cannot be solved by a single person or even a single discipline (Sriraman & Freiman, 2010). Therefore, an interdisciplinary approach is a key element for any successful educational enterprise, which aims to prepare future generations to deal with the increasing complexity and interconnectivity of our world.

There are ambiguities in what constitutes interdisciplinarity or creativity across disciplines similar to the domain specific and domain general debate in cognitive science (Simonton, 2012). In other words, are the knowledge and skills we learn in one domain transferable to another domain? This debate echoes most when applicable to eminent contributions, i.e., can individuals with high ability make sustained and varied contributions at the helm of different disciplines? Ambrose's article is a culmination of previous work (Ambrose, 2003, 2005, 2006, 2012) that has explored different facets such as aspiration development and contextual influences with an interdisciplinary framework and points to different forms of "border-crossing" work. He states that:

> The degree of conceptual integration increases as an individual or a team made up of researchers from different disciplines moves from one end to the other of a continuum with multidisciplinary work fitting at the least integrative end, transdisciplinary work fitting at the most integrative end, and interdisciplinary work in the middle. (see Ambrose's article, this issue)

A part of the article is focused on debates within cognitive science on appropriate metaphors for the brain. The term "complex systems" is used for the phenomenon arising in any inquiry of human beings *in situ* society, and the need to move beyond rigid research frameworks. After all a student (high ability or not) does not exist in a vacuum encountering knowledge. Yet information processing metaphors played a major role in research on mathematical thinking and learning in the 1960s and 1970s whereby phenomena were reduced to condition-action rules. Four decades later models and modeling frameworks emerged as a redeeming research framework for mathematical thinking by realizing the relevance of *American Pragmatists* such as William James, Charles Sanders Peirce, Oliver Wendell Holmes, George Herbert Mead, and John Dewey. Lesh and Sriraman (2005) summarized this interdisciplinary trend as follows: (a) Dewey and Meade emphasized that conceptual systems (in our case: mathematical thinking and learning) are a human construct, but fundamentally social in nature; (b) Pierce emphasized meanings of these constructs tend to be distributed across a variety of representational media (ranging from spoken language, written language, to diagrams and graphs, to concrete models, to experience-based metaphors); (c) Dewey emphasized that knowledge is organized around experiences at least as much as around abstractions. Decision-making situations nearly always must integrate ideas from more than a single discipline, or textbook topic area, or grand theory; (d) James emphasized that the "worlds of experience" that humans need to understand and to explain are not static but products of human creativity are continually changing; (e) Dewey emphasized that, in a world filled with technological tools for expressing and communicating ideas, it is naïve to suppose that all "thinking" goes on inside the minds of isolated individuals (pp.10-12).

Problems known as model eliciting activities (MEAs), which arose from this framework have made sophisticated mathematical ideas hitherto the privy of a few, accessible to more students (Lesh & Sriraman, 2010). The effectiveness of MEAs have been documented for instance in Purdue University's *Gender Equity in Engineering Project,*

students' abilities and achievements were assessed using tasks that were designed to be simulations of "real life" problem-solving situations not emphasized in traditional textbooks or tests. Lesh, Kaput, & Hamilton (2006) reported that a broader range of students naturally emerged as having extraordinary potential, and surprisingly enough, these students also came from populations (females and minorities) that are highly under-represented in fields that emphasize mathematics, science, and technology; and this was true precisely because their abilities were previously unrecognized. In other words, MEAs resulted in a hitherto unknown cognitive diversity in the range of responses/solutions. Even in the domain of mathematics where deductive proof was the *sine qua non* for centuries, it has been replaced by experimental mathematics. At least since the age of written media, mathematicians have been off-loading formerly manipulatable objects with increasingly powerful notations, which encapsulate numerous subconcepts (and processes). For example, a category encapsulates notions of sets and functions. A functor encapsulates categories and morphisms. These are examples of highly abstract objects that have evolved as a result of increased sophistication in the use of mathematical language. Thus a student who wants to "discover" original results say in Analysis or Algebra faces the obstacle of first learning a language that increases in its notational complexity as they progress through undergraduate and graduate level coursework. Even simply posed problems such as those found in number theory books very often need sophisticated tools from homological algebra to provide any reasonable answers. On the other hand the approach of experimental mathematics proposed by Borwein (2009) challenges the mathematical community to re-examine the role of deductive proof especially in the light of the fact that computing (and digital) packages can assist in discovering new results as well as check all possible cases (for a proof).

> I believe that the mathematical community (appropriately defined) is facing a great challenge to re-evaluate the role of proof in light of the power of current computer systems, of modern mathematical computing packages and of the growing capacity to data-mine on the internet (Borwein, 2009, p.1).

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More importantly the ontological orientation of the school of experimental mathematics is that students need to cultivate insight into "how" to find a mathematical result and convince themselves of its truth before becoming encumbered in epistemological issues of notation and deductive reasoning. Experimental mathematics not only builds on the ideas of George Polya on the heuristics of plausible reasoning, but also opens up mathematics as an interdisciplinary subject with ideas of experimental work borrowed from the natural sciences, aided by computer science. Ambrose alludes to the work of Byer (2007) on the nature of inquiry in mathematics and suggests "a form of dogmatism in which their minds are captured by *sterile certainty*--the imposition of somewhat artificial, unwarranted conceptual order on the constructs they are studying."

Some instructional approaches are particularly important in opening up disciplines in ways that might provide new avenues for access to populations who might otherwise be marginalized by the "school experience". Hersh (1991) points out that the enterprise of mathematics is organized, like many other social institutions, into a "frontside" and a "backside". Like restaurants, theaters, and libraries, mathematics is characterized by differential activity being carried out in two marked "regions of activity". On the frontside, mathematics is presented in finished form as precise, clear, ordered, and abstract. Progress is deductive and axiomatic, proceeding from givens to theorems and lemmas through chains of logical reasoning. Subregions of the frontside of any social institution are divided into classes (i.e. box seats versus balcony seats at an orchestra concert). Witness in mathematics the

professional mathematician, the graduate student, the undergraduate student needing remediation in mathematics.

In contrast to the frontside, the backside is "mathematics as it appears among working mathematicians, in informal settings, told to one another behind closed doors" (Hersh, p. 128). Here, mathematics is fragmentary, informal, intuitive, and tentative. Activity is characterized by failed attempts, inductive reasoning, competing and conflicting notation, and even disagreement. Here, the necessary skills are creativity, ingenuity, and a willingness to conjecture and to explore. Hersh (1991) argues that the duality of mathematics as a social institution functions as a preservation mechanism to the myths of unity, objectivity, universality, and certainty, in mathematics.

Hersh's (1991) characterization of mathematics is useful in that it helps us identify the stratification of mathematics as a social institution and the necessary pathways by which students access mathematical knowledge. Certainly the "frontside" of mathematics is the mathematics that most school children experience in the classroom, where, "The goal is stated at the beginning of each chapter, and attained at the end" (p. 128). Further, finished-form-mathematics leaves little room for creativity and inventiveness as it arrives to the student, like a finely-cut diamond, as something to only behold and to admire.

The deductive, axiomatic nature of the "frontside" of mathematics naturally sequences mathematical instruction, building new knowledge on old, increasing in complexity and inter-dependence. One potential byproduct of this structure is the alignment of "content mastery" with ability in mathematics. One's ability to progress in the "frontside" of mathematics is directly linked to one's ability to master content, that is, to memorize and to regurgitate mathematics as an indication of mathematical intelligence. Surprisingly, such skill is little valued in the "backside" of mathematics where brilliancy is aligned not with repetition and replication but rather with creative and inventive thought applied to inherently open-ended settings. But, as Hersh (1991) points out, initiation to the "backside" occurs only at the end of the mathematics education delivery structure, that is, in graduate school, typically in a dissertation study.

One must ask if entrenched social structures, like the one that Hersh (1991) describes, have a marginalizing effect on the development of high-ability students in the 21st century. Accepting the affirmative answer, one must search for a remedy to the situation. Again Hersh's (1991) metaphor is helpful. The deconstruction of the frontside/backside duality of mathematics as a social institution depends on the incorporation of "backside" mathematics in regular instruction. Rather than reserve open-ended, investigative, and creativity-dependent mathematics experiences for only those at the highest levels of study, integrate such experiences across the curriculum so that all students gain access to authentic mathematical experiences heretofore denied them.

Another theme in Ambrose's article warranting comment is changing STEM (Science, Technology, Engineering and Math) education into STEAM education by incorporating Arts as a vital interdisciplinary link. Gifted Education has placed an over-emphasis on the development of ability in STEM disciplines which tend to marginalize students who do not fit into traditional curricular trajectories of math-science in schools. Disciplinary boundaries and tensions that came out of the Renaissance, namely natural philosophy, art, alchemy (metallurgy/chemistry), theology as the first rupture continues today in the modern day antipathy among the ever increasing subdisciplines within arts, science, mathematics, and philosophy. Many of the thinking processes of polymaths who unified

disciplines are commonly invoked by artists, scientists, mathematicians, and philosophers in their craft albeit the end products are invariably different (Sriraman and Dahl, 2009). These disciplines explore our world for new knowledge. For instance, literature is an excellent medium to create frequent shifts in perspective. Paradoxes can be easily investigated by exploring geometry motivated by Art. After all Art suggests new possibilities and pushes the limits of our imagination, whereas science verifies the actual limitations of these possibilities using mathematics. Models and Theory building lie at the intersection of art-science-mathematics. The history of model building in science conveys epistemological awareness of domain limitations (Root-Bernstein, 1996). Arts imagine possibilities, science attempts to generate models to test possibilities, and mathematics serves as the tool. The implications for gifted education today is to move away from the post Renaissance snobbery rampant within individual disciplines at the school and university levels by using interdisciplinary approaches that make math and science more accessible (Sriraman and Dahl, 2009).

Our final comment is on sections of Ambrose's article which suggest interdisciplinary approaches to address *epistemological pluralism* and *cognitive diversity*. The promulgation of such an approach rests upon the actions of future teachers. The actions of future teachers rest upon the beliefs teachers hold as to "what counts" as good mathematics instruction. These beliefs are formed primarily through experiences in mathematics classrooms. Given the "status quo" stabilizing nature of the K-12 school mathematics culture, hope for the reorganization and renovation of mathematics instruction rests solely upon those who are in possession of the knowledge that Ambrose has collected and shared, that is, upon teacher educators. While some research has demonstrated that the incorporation of interdisciplinary educational experiences promoting epistemological pluralism and cognitive diversity as part of teacher education can have an expansive effect on future teachers' beliefs about mathematics and mathematics instruction (i.e. Roscoe & Sriraman, 2011) much work remains to be done to support and to sustain the enactment of these beliefs in the classroom. While the renovation of teacher beliefs is an important starting point for the vision that Ambrose has collected, real challenges lie ahead in terms of professional development, curriculum development and, perhaps most importantly, financial remuneration to support change.

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**Commentary (11):**

# Research Journey in Diversity: Focus on Gifted Population

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**Keywords:** Diversity and inclusive education; professional development for educators; student teaching; culturally and linguistically learners; gifted education; multicultural education.

## Diversity and preparing teachers

Western nation-states like the United Kingdom, Australia, the United States and Canada are multicultural societies (Banks & Banks, 2010). World-wide immigration and globalization have resulted in increased religious, racial, ethnic, linguistic and cultural diversity – diversity that is increasingly reflected in universities and schools (Banks, 2008). The ongoing changes in demographics and economics of these multicultural societies create a need to prepare global citizens, connected through transportation, information and communication technologies (Clark, Facching-Varner & Brimall-Vargas, 2012). Classrooms of the 21st Century will include children from varied ethnic groups and cultures, and teachers will need to recognize the differences among the diverse populations in Preschool-Grade 12 [P-12] curriculum and instruction. Moreover, if educators from various disciplines acknowledge that we live in an increasingly diverse society, then the time appears ideal, as Dr. Ambrose addresses in his scholarly writing, to participate in collaborative interdisciplinary efforts and realize the significant advantages when multiple disciplines are involved.

Multicultural education is complex and cannot be oversimplified. It goes beyond promoting content about varied groups, reducing prejudices or celebrating ethnic events (Banks, 2008). Multiculturalism and diversity are more than just essential topics for those in higher education to appreciate, explore and understand. Those who work in higher education face challenges related to diversity which are unique to colleges and universities, and there are few resources about how best to address the challenges (Clark, et al., 2012). According to Banks & Banks (2010), multicultural education practices, programs and courses developed as responses from educational institutions to meet the challenges and strengths of diverse groups.

Multiculturalism and diversity present major challenges for most fields of study, and comparable challenges exist within interdisciplinary endeavors. Is it possible for scholars from different disciplines to create a conceptual framework for the field of gifted education if they believe it could have far reaching impact for all disciplines involved? Could these same scholars share their intellect, background knowledge and expertise to raise the importance of the gifted population? If so, what is the best process, and what field

should guide selection of principles for the framework? If scholars can agree on the best process and guiding principles, how will it be designed to benefit gifted and talented children and youth? Will scholars place their focus on academic, social, and meaningful characteristics to meet specific needs of the gifted population? Will an established framework then be used to develop instructional plans and/or specialized programs?

What do academic disciplines or fields of study have in common about the gifted and talented population? My research journey in diversity with a focus on gifted children actually began with a common inquiry about reading capacity. Should the initial guiding process include questions about students working to their capacity and ability of educators to determine capacity? Academic achievement is clearly a goal all disciplines have in common, and most scholars would agree, being able to identify and encourage gifted individuals has the potential to positively influence a particular discipline or field of study. Ambrose notes that many scholars may be willing to be involved in interdisciplinary work based on their affinity for exceptional intelligence because they are exceptionally intelligent. It begs a question about whether or not the same scholars were identified as gifted early in their academic lives, and if they were they guided by a "framework" that clearly supported their needs and aspirations?

Teacher educators will have to build competencies, increase knowledge and guide classroom teachers as they work to ensure that all children reach their potential and academic success. At the institutional level, faculty must be able to promote diversity and prepare classroom teachers for increasingly diverse populations in our schools today. Revised in 2010, the *Standards for Reading Professionals* include a distinct Standard for Diversity developed by the Standards 2010 Committee of the International Reading Association. Standard 4 Diversity states: "Candidates create and engage their students in literacy practices that develop awareness, understanding and respect, and a valuing of differences in our society" (International Reading Association, 2010, p. 12). By definition, the Standard communicates the importance of providing an equitable reading education for children in a democratic and just society, and notably, equity involves being respectful of student differences such as race, class, gender, ethnicity, religion, language and culture. Ambrose unintentionally referenced the definition in part, when he joined with the world's leading minds in history, sociology, political science, philosophy, legal studies and other fields delving into the ethical dimensions of giftedness.

Gay (2010) believes that most culturally diverse children and their teachers live in very different worlds and do not understand or appreciate the reality of those experiences. Daily interactions of teachers and children in the classroom may not provide enough contact and can distort perceptions, beliefs and attitudes toward diverse groups, individuals and cultures. When individuals and groups with differences and different backgrounds spend time together, change is certainly expected (Nieto, 2010). Perhaps, that is because culture is dynamic, takes place through interactions and cannot exist outside of association and contact with others. It will be essential that teachers and prospective teachers examine their own beliefs and find opportunities to enhance their knowledge and skills about cultural diversity (Gay, 2010).

A major reason teachers need to understand the nature and culture of children in the classroom is so they can develop students' learning and thinking (Dewey, 1933). It may be challenging to teach students how to think, but students have to be able to learn to think well. According to

Dewey, children may not be able to think about everything, but they cannot think about anything if they do not have enough information about it! How do educators cultivate attitudes that encourage reflective thinking such as curiosity, open-mindedness, enthusiasm, responsibility and involvement (Dewey, 1933)?

A fundamental principle in higher education research suggests that there are firm interconnections among individual, institutional and social changes. Can scholars from multiple fields somehow interconnect through individual, institutional and social changes? The research is clear that diversity contributes to educational benefits, but we are just beginning to learn how or what conditions nurture those benefits (Chang, 2013). Perhaps, a strength of Dr. Ambrose's interdisciplinary research on behalf of gifted and talented is the diversity among those who contribute, not only their theories and investigative tools, but relative demographics and values. Hopefully, questions about diversity will continue to produce a detailed body of research to improve educational opportunities in response to significant demographic shifts. We do know that the relationships teachers develop with children are key to children's learning, and competent teachers who recognize the differences among the children can build the capacity of all the children in the classroom (Nieto, 2010).

All children have multiple identities and differences that determine who they are, consisting of gender, race, social class, ethnicity, national origin, religion, ability and so on. In order to be effective, teachers must be supportive and aware of how children negotiate multiple identities while growing up in a complex time (Nieto, 2010). Major variables such as race, class, gender and exceptionality influence student behavior (Banks & Banks, 2010).

Teachers who learn how to build on the language and culture of the children in the classroom will be able to understand the children's background and capacity for learning and adjust instruction without lowering expectations for learning (Banks & Banks, 2010).

## Diversity and advocating for neglected populations

The responsibility of offering equal educational opportunities for students with diverse abilities is immense (Banks & Banks, 2010), and teachers must advocate for all children, especially children who represent a diverse population. This research journey in diversity focuses on gifted children, a population often overlooked and neglected. How is it possible that some of our most capable students in the classroom are overlooked? It is true that gifted children are most likely already high achieving academically, and may be neglected with efforts directed to students who are struggling in the classroom (Finn & Sousa, 2014). Children who are intellectually talented and gifted are considered exceptional, often described as students with learning or behavioral characteristics different from other children in the classroom, requiring teachers to be especially attentive to instruction (Banks & Banks, 2010). Gifted children who live in poverty may be among the most overlooked in terms of identifying potential, since there are few resources at home or parents who may not realize the capabilities of their exceptional children.

A review of the literature in the mid-1990's which focused on educating teachers for diversity, noted the growing differences among the backgrounds of teachers and their students. Successful teachers would have to be aware of demographics and differences of students' backgrounds and experiences to structure programs and strategies to address the

demands of all students. This culturally responsive approach to teaching would entail high expectations, scaffolding, knowledge, parent involvement and assessment (Zeichner, 1996). In a related study conducted from 1995 to 2004, involving a number of prominent journals in both multicultural education and gifted education, Chamberlain (2008) determined that gifted education is often not included in multicultural journals. By contrast, gifted education issues embodied multicultural education in their journals. Another interesting study conducted by Delandtsheer (2011), documented the author's results of 100 time-on-tasks research in the classroom, which stated concerns that gifted children spend nearly 20% of their day waiting for others to complete coursework. If you calculate at that rate, by the time a gifted student graduates from high school, he/she has spent nearly two years of his/her educational career waiting (Delandtsheer, 2011).

Educators must continue to realize that giftedness is culturally embedded and value the importance of features about gifted children that we cannot yet explain (Renzulli, 2004). Could those features be discovered if we purposely collaborated to form an interdisciplinary process and planned to not only raise the importance of the gifted population, but guide and support an often neglected population? Ambrose offers examples of interdisciplinarity in complex disciplines which include growing interdisciplinary work in complexity theory, the study of complex adaptive systems and the interdisciplinary field of cognitive science. Ambrose suggests the field of cognitive science with its influential mind-related efforts could inform gifted education and attempts to understand high ability and borrowing insights from complexity theory can provide ways to structure learning environments.

Educators often define giftedness through intelligence test scores, with children and youth who score at the top percent [3 – 5%] identified as gifted. One of the most influential descriptions of gifted children is the *Marland Definition*. The definition has been used extensively to inform programs and policies around the World. In part, the *Marland Definitio*n defines high performing children as those who demonstrate achievement and or potential intellectual capacity; psychomotor abilities; creative thinking; leadership; visual/performing arts; and or specific academic aptitude (Marland, 1972).

Some gifted children in terms of measured capacity fail to live up to their potential in school or life beyond education, and one possible reason is the tendency for some children to not develop their capacity to meet the challenges of learning (Tunnicliffe, 2010). Teachers may not always question whether children are working up to their capacity according to Barr, Blachowicz, Bates, Katz and Kaufman (2013). If teachers orient instruction to help lower achieving children develop skills required for reading materials in the classroom, teachers could inadvertently overlook gifted, talented children. Children who are gifted may be reading easier materials than they are capable of reading or texts that do not correspond with their capacity. It is key that teachers be aware of these possibilities, so gifted children receive instructional guidance and appropriate materials to assist them to reach their potential.

## Diversity and identifying needs

All readers require assessments to help determine their strengths and areas of development. Teachers need to conduct comprehensive evaluations in schools to determine potential, monitor progress across grade levels and ensure students are learning and developing various aspects of literacy (Lesaux & Marietta, 2012). When teaching gifted and talented children, it is imperative to discover the reading instructional needs that children bring to the learning situation; and one of the best ways to do that is by using an informal

reading inventory. The informal reading inventory is a useful assessment that can benefit all children, and teachers can employ the data for personalized instruction of gifted students.

An informal reading inventory such as the Qualitative Reading Inventory – 5 (QRI) (Leslie & Caldwell, 2011) provides an abundance of data about word recognition knowledge and comprehension and other aspects of reading. For word recognition, it offers insight into a learner's letter and sound knowledge, structural (syllable) analysis abilities and morphemic (i.e., affixes and roots) knowledge, at an isolated word level and in the context of narrative or expository passage text. The data derived from the word lists informs automatic word knowledge, and as we know, the more words immediately known and not requiring extensive analysis by the reader which initially requires instruction, the easier the task of reading (Caldwell & Leslie, 2009). All analyzed words both familiar and unfamiliar eventually become sight words. It also means that when words can be problem-solved or easily identified, more attention can be directed to help the child comprehend the meanings conveyed in text.

The informal reading inventory passages yield pertinent facts about reader comprehension performance with respect to literal and inferential question types for particular passage levels. The word list data is helpful to select a beginning passage level to employ with a reader for each type of text read in context. The graded passages which are often read aloud by beginning and developing readers reveal particular characteristics about reader comprehension and recall for text. Passages can be read silently, especially if that is the typical reading process in upper elementary, middle grades and high school. The QRI is the only informal reading inventory that can be administered with a group or entire classroom of students in Grade 3 and higher by using silent reading with a leveled passage. If the reader does well with recall and answers questions with a leveled passage, it is likely that oral reading word recognition knowledge is sound. However, if the reader does not perform well with comprehension during silent reading, it is advisable for the student to read the passage aloud in order to discern if word recognition knowledge inhibits comprehension of text.

Based on QRI performance criteria of the number of miscues while reading aloud and the number of comprehension questions answered correctly, one can estimate the independent, instructional and frustration reading levels for grade level passages. The processes of oral reading and comprehension are evaluated per leveled text passage (Afflerbach, 2012). These reading levels are traced back to the work of Betts (1946).

The Betts levels are part of the Qualitative Reading Inventory and most informal reading inventories. By comparing and contrasting reader performance for the processes of word recognition and comprehension, the teacher interprets which process is the strongest or weakest, and if performance for both processes is similar. The latter implies a balanced program of instruction for word recognition and comprehension. After you discern the instructional reading level for narrative text, you assess expository text at the same graded passage level. By comparing instructional reading level performance with each type of text, you can denote which text the student reads the best. If a particular genre is more challenging than other genres for the reader, it is helpful to use the challenging text type during individual or guided reading instruction.

For gifted children, and all students in the classroom, an informal reading inventory can estimate the listening comprehension level and potential for diverse readers. Listening

comprehension specifies the capacity level of the reader and the existent verbal knowledge when print knowledge difficulties, if any, are eliminated (Barr, et al, 2013). A reader should be able read to the highest passage level that he/she can successfully listen, responding to questions at the instructional reading level (Leslie & Caldwell, 2011). A reader's listening comprehension level increases by learning meaningful language via listening, speaking, reading and writing.

## Diversity and engaging children

Teachers also need to assess the interest(s) of gifted and talented children to engage learners. If teachers are aware of the dispositions and predilections of readers, they can select books that correspond to appropriate reading levels, originally depicted by Betts (1954) and extended by Barr, et al (2013).

The Betts reading levels are contiguous levels, and if you determine one level, you can anticipate other levels (Afflerbach, 2012; Leslie & Caldwell, 2011) which are verifiable by reading QRI leveled passages. The easy independent reading level is a level the reader can read texts alone, with minimal supervision. The instructional reading level is the ideal reading level for instruction, but does necessitate teacher guidance and instruction when applied. The frustration reading level is challenging, and needs to be utilized with caution. Although questions about using the frustration reading level continue, Betts (1954), Allington (2009), and Afflerbach (2012) do not advocate children reading texts at the frustration reading level. If teachers encourage reading texts at the frustration level, it is critical they provide scaffolding for the reader. When teachers select books for gifted and talented readers, they should make certain the books are no more than one grade level above the instructional reading level for a particular type of text [narrative, expository].

Of course, it is vital to plan positive and meaningful experiences with reading so all children want to read. Finding books that match the interests of readers increases motivation and enjoyment of the reading process (Barr, et al. (2013). Teachers can strategically select books of interest to match students' instructional reading level(s) if they take time to administer an interest inventory. Interest inventories are significant for increasing learner achievement and encouraging life-long reading (Afflerbach, 2012). Children's interests need to be acknowledged and used to advantage, and may be topic specific or general in nature. Teachers can arrange books collected of interest according to reading grade level(s), from easy to more difficult to correspond with reader needs and instructional goals, keeping in mind that what might be difficult or challenging to one student, may not be for another student.

Publishing companies could indicate a grade level, range of difficulty or Lexile score for a particular book. Teachers can estimate the reader's instructional reading level for a particular genre of text derived from an informal reading inventory. Given such knowledge about levels, one of the most immediate ways to determine whether the text is at the appropriate level of difficulty for the reader is to conduct an oral reading running record. An oral reading running record is a useful assessment to verify the readability of text and monitor ongoing progress of reading. Teachers can accomplish this assessment for any text in approximately three to five minutes.

Recommended percentages exist for calculating the total word accuracy of words read aloud during a running record of continuous text. The percentages estimate the Betts reading levels of a grade level of a text in question (i.e., Allington, 2009; Barr, et al., 2013; Betts,

1954). Calculating percentage of accuracy involves recording and tallying the miscues made by the reader, dividing the total words correct by the total number of words attempted, and multiplying by 100. The percent of accuracy alludes to the complexity and challenge of the text for the reader. The Betts levels and percentages of accuracy, respectively, are 98 to 100 percent for independent reading level, 95 to 97 percent for instructional reading level, 90 to 94 percent is deemed borderline and 89 percent and below is deemed frustration reading level (Barr, et al.). While a running record accents print knowledge and performance, you can acquire comprehension information from a retell for the text read. It might be helpful to prompt the reader with a directive such as "tell me something about what you have just read" to inform comprehension, the ultimate of reading. It is useful to compare comprehension and word recognition performance from the informal reading inventory with data derived from completing the running record assessment process. The results of running records can serve as a window to the reader's print and comprehension processing, current and ongoing progress for reading, and the correctitude of the text under consideration.

## Diversity and moving forward

Discussions about identifying and supporting diverse populations such as gifted children must continue, especially among minorities, disadvantaged and culturally different students. Fair identification will have to include assessments that respect diversity, accommodate students' developmental differences, and determine potential and talent (Renzulli, 2004). It will be necessary that faculty in higher education study the literature about diverse populations in P-12 curriculum and instruction, remain current with evolving research, and further, devote time to understand and apply practices to expand and improve learning environments for teachers and prospective teachers. There are important questions related to attitudes and beliefs about cultural diversity that have to be a major part of teacher education programs and professional practices at this time of increased diversity in schools because there are many children in P-12 who may need different interventions to improve their educational opportunities and achievement (Gay, 2010). Much like diversity, children's capacity for learning does not remain static or unchanging. Dr. Ambrose would likely agree that children's capacity for learning is endless, and perhaps, that is among the reasons he wants to learn from the insights of other disciplines to expand and strengthen the conceptual framework for gifted education, a conceptual framework that could be applied to improving policies and practices on behalf of the gifted population.

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## Related Resources

1. Southern Poverty Law Center – School Climate Survey to uncover differences in teacher and student perceptions www.splcenter.org [Provides free educational resources to teachers and other school practitioners in Canada and the United States. Teaching materials have won two Oscars, an Emmy, and 20 honors from the Association of Educational Publishers. There is a one-page SCHOOL CLIMATE questionnaire that can be used to discover differences in teacher and student perceptions. The web address to access the questionnaire: www.tolerance.org]
2. Chronicle of Higher education – Diverse International/Diverse: Issues in Higher Education http://diverseeducation.com [The Chronicle of Higher education is an award-winning global media organization. Diverse is committed exclusively to diversity issues.]
3. John Hopkins Center for Talented Youth http://cty.jhu.edu [World leader in gifted education, including research originated under Dr. Julian C. Stanley in 1971 to identify brilliant 12-year-olds, following their education, careers and lives. The research became the World's longest running longitudinal survey of gifted. There are resources for parents, schools and students.]
4. The text [also included in the References] by John Delandtsheer (2011), entitled Making ALL Kids Smarter: Strategies That Help All Students Reach Their Highest Potential. [Author focuses the text on gifted and high-ability students, but designed the instruction to be compatible with how the brain processes information not only for making bright children smarter, but making even more children smarter.]
5. Crushing Tall Poppies Website http://crushingtallpoppies.com [Author Celi Tre'panier is an advocate for gifted children. Among posts, she created a checklist with traits about gifted children indicating #1 – gifted children do not always excel in school. #1 was also #10 on the checklist to indicate significance.]
6. National Association for Gifted Children http://www.nagc.org [Includes Global Awareness Network in response to concerns of the gifted and talented about the World they live in by providing opportunities to grow in understanding of different cultures and global interdependence. Also includes Timeline, noting the earliest systematic effort in public schools to educate gifted students occurred in 1868!]
7. A text by Will Kymlicka (2007) entitled Multicultural Odysseys: Navigating the New International Politics of Diversity. [Author of books and articles on multiculturalism and minority rights.]

## About the Author

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**Commentary (12):**

# A Response to "Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundation for Gifted Education"

**John P. Anchan**
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**Keywords:** Interdisciplinarity; pedagogy; professional development for educators; Canadian Metropolis Education Network; creativity in teaching

As a preamble, this commentary is a response to the article *Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundations for Gifted Education* by Don Ambrose and may exhibit shades of amphigoric pugnacity. Nevertheless, it is written with the intent to challenge readers on some truisms that hopefully, will contribute to a discourse of critique.

Ambrose convincingly argues for interdisciplinarity - especially, in gifted education. He provides cogent examples and lucid metaphors and raises a number of illustrations that challenge the current trend toward insularity. One does not even have to begin explicating interdisciplinary conflicts before acknowledging the ongoing historical tensions within research methodology on the duality of qualitative vs. quantitative; research vs. teaching; "theory and practice"; "hard science" vs. "soft science"; "objectivity vs. subjectivity"; inductive vs. deductive and so on.

The polemical rumination on our fixation with dualities does not really contribute to the discussion of interdisciplinarity - esp. when addressing research methodologies. Yet, in a very paradoxical way, scholars who have crossed the borders of disciplinary silos (e.g., scientists who have moved into arts and vice versa; physicians who are trained in pedagogical techniques in education; historians who become business administrators, etc.) have proven to possess a wealth of experience, richness in thought processes, ability to successfully combine the contributions of various fields in most unique ways. This happens to be the cornerstone of any liberal arts education. Strangely enough, in the age of super-specialization, post-secondary education typically channels new scholars into increasingly narrow specialties that tend to become silos of parochial knowledge. The intent here is not to discredit or enervate the value of specialization. Rather, the compelling logic is to consider a more cross-discipline experience to enrich different fields of expertise. Perhaps, such "cross-fertilization" of fields and ideas may surprise some of the misinformed arguments about the so-called "peripheral or other disciplines." The value of interdisciplinary approach not only enriches the pursuit of scholarship, it also educates the specialist about the tapestry of various fields that create a symphony of knowledge. This in a sense, is not a new or revolutionary thought. Thankfully, many fields have already

realized this advantage and perhaps, more such interactions will ensue to benefit the common good.

As McCluskey & Yamin in *From the Founders* respond, gifted education also has evolved and transformed from a relatively narrow focus on enrichment to an inclusive and diversified approach within an integrated curriculum. Perhaps, preceding this protean adaptation, the prevalent exclusivity reflected the belief that giftedness was unique to only a few selected rather than an inherent characteristic hidden and untapped among the many. Thus, not only the target group changed but also the gifted education itself evolved for the better. Indeed, though not always by design, intentionality attempts to become excepting in that the basic human nature tends to protect exclusivity and privilege favouring the few even while marginalizing the rest. Though this is an interesting pedantic exercise that can engage academics forever, humble but important initiatives such as the ICIE International Conferences and Lost Prizes/ICIE Seminars attempt to become seminal confluence for interdisciplinary dialectic (ICIE, 2015; Lost Prizes International, Canada, 2015). These are venues that allow discourses towards explicating meaningful change that can break away from the rigidity and constraints of boundaries that traditionally preclude sharing and exchange of ideas across disciplines.

Insularity is the bane of specialization and the harbinger to a parochial state of attrition. Isolationism within a domain has never won any admirable laurels for vibrant enrichment or garnered evidence for strong diversity. This is true for any field of expertise. The revelation is quite obvious in what I call, the "Kuhnian Experience" in relation to a paradigm shift (Kuhn, 1962). The epiphany that frees one from a field-constrained dogmatism can definitely be a liberating experience.

I would even extend this argument to suggest that interdisciplinarity at the global level beyond the confines of a particular culture and history can be quite educational. Some of the political analyses and remedies tend to suffer due to constraints arising from lack of cross-cultural and cross-discipline analyses. Whether irredentism, poverty alleviation, environmental sustainability projects, crime prevention or social projects - they all could benefit from integrating multiple perspectives and multifarious experts hailing from various fields.

Ambrose's description of "border crossing" is quite powerful - in that, it signifies building bridges to overcome barriers of limitations between disciplines. There are a number of success stories but one that comes to mind is the field of comparative education or international education or development education (terms used interchangeably). Scholars in this area of specialty have generously shared across various specialties to create a strong field of expertise, thereby enriching the analyses of global intricacies and development.

Another tangible example is the research network, *Metropolis International* with national bodies in various countries. Not unlike their counterparts across other countries, the Canadian Metropolis network of researchers (professors, students, research assistants, etc.) consisted of government bureaucrats, policy-makers, service providers, community representatives and non-government organizations, etc. (Metropolis, 2000). During its existence, the typical Metropolis national or international conference was a vibrant community of diverse stakeholders from various backgrounds and interests. Some of the most interesting conference workshops happened at these conferences. Besides the dissemination of research projects, the Metropolis encouraged excellent scholars and produced priceless plethora of research findings that went beyond usual academic

rumination. They became foundational materials for meaningful consultations resulting in tangible outcomes for policy and decision makers at all levels of government. The Metropolis is just one example of many such endeavours where interdisciplinary collaboration can benefit and strengthen production of authentic knowledge.

Not only has gifted education matured, it also offers the promise of transforming precious lives - something much more profound than mere reflective polemics. As McCluskey & Yamin describe, these unique initiatives entail transformation that moves beyond the eudaemonia of theoretical discourses to actual praxis. From a perspective of Critical Theory and empowerment pedagogy, Lost Prizes and ICIE have stepped beyond the ivory tower to reclaim lost talent and in so doing, have indubitably provided evidence-based practice proving the value of wandering beyond the comfort zones of self-inflicting academic rumination (McCluskey et al, 2015). While the production and dissemination of knowledge within the portals of research towers remain vital, it is of immense value to translate and implement such exercise towards creating a better world.

Those seemingly esoteric interspaces occupying the terrain between Underachievement and Achievement are really not lost spaces. As the Modified Prism Metaphor for Reversing Underachievement elucidates, the promise of change is evident in a methodology borne out of the Vygotskian extension. A purposeful, and meaningfully designed learning environment can effect dramatic results. Perhaps, some of the old debates on "tracking" or "streaming" can serve as strong evidence to social engineering masquerading as targeted learning. To go even further back, schooling and reproduction come to mind. In relation to this discussion, I have raised the myth of IQ tests elsewhere (Anchan, 2012).

Ambrose's challenge that we "cross border fences into [other] disciplines" is a clarion call for an interesting and enhancing experience. This, of course, is also true for the field of gifted and talent. One way to treat reductionism and determinism is to open our vision to fields beyond the horizon. Working within silos of specialties may preclude the richness of cross-discipline contributions to any given field of work.

Not to pick on one field but Ambrose raises an example of "psychology craving for recognition" as an accurate science. One may be familiar with the more recent controversial article on replicability and psychology (Klein et al, 2014). Does this make psychology "less accurate"? Obviously not! Yet, the debate on research methodology surrounding validity vs. reliability continues ceaselessly with two strongly differing and immutable sides engendered in typical dogmatism and controversy. The point here is to highlight the existence of "pseudo-silos" that Ambrose brilliantly describes. This may entail unfortunate restriction of healthy growth and development in any field afflicted by fragile and unsubstantial hierarchies of superior vs. inferior imaginings. Though this might come across as too strong or contentious, Ambrose has raised an important insight into the dysfunctional perceptions about the veracity of various fields of expertise. He not only challenges this perception but encourages us to go beyond borders to "reach out and touch" other fields and in the process, immensely benefit from such symbiotic relationships.

One can recall the common adage, "Lies, damned lies, and statistics" or Mark Twain's quote on "lies, damned lies and statistics." Again, this is not to pick on one particular field because, "people in glass houses shouldn't throw stones." Every field is guilty of such arrogance. A house owner may realize that the tradesperson's

qualification and skills to fix a house furnace are different from his or her own ability to compile a computer software program. This also ties in with Gramscian "knowledge" and "organic intellectuals" (Gramsci, 1998) or the Freirean concept of knowledge in relation to adult education (Freire, 1983). One could truly learn from another - whether a person or a field of expertise, and to argue otherwise is a true reflection of exiguous confidence sandwiched between ignorance and arrogance.

The current trend for "measurement outcomes" that misguidedly supposes everything can be measurable seems to be another pipe dream for empiricists. This may be true for some areas that can be measured but could be a slippery slope for others. A true incident, vividly described elsewhere (Anchan, 2012), demonstrates the myth behind empiricism bathed in determinism. The student in this case, defends empiricism throughout the dissertation defense - only to be confronted with the ambiguity of quantifying "relief." This is an example of being sequestered within a dogma confined to a narrow field or discipline.

Another real life incident warrants mention. At one of the briefing sessions by a powerful government bureaucrat from a federal funding agency, we the researchers were ceremoniously ushered in to be informed that funding would be restricted to "true research involving numbers and statistical data." Anything beyond that would not even be considered for funding. The handful of researchers present wished they were elsewhere - in a more discerning gathering.

Nevertheless, the adage, "he who pays the piper calls the tune" reverberated in our minds. While some of the few misguided researchers at this gathering supported this view and looked triumphantly elated, the rest of the disillusioned crowd made a beeline to the bar to drown their sorrows. This incident actually reinforces the need for more informed, knowledgeable, and qualified academic scholars in strategic government positions. Historically, the lack of critical hiring has done a disservice to credible research and to the detriment of meaningful education.

Not unlike other disciplines, gifted education is also subject to the same parochialism. I concur with Ambrose that we are not suggesting one over the other (empirical over qualitative, or so on) nor do we want to subject to the duality-syndrome that plagues some. Rather, it is a position that envisions freely borrowing from each other towards complementing and strengthening the process of discovery. These differences are neither exclusive nor incompatible.

Ambrose provides examples from various disciplines to argue that theoretical dogmatism within a field can be devastating and detrimental to the discipline. A multidimensional interdisciplinary collaborative approach does not imply compromise in the process of analysis. In fact, one cannot dispute the compelling notion of "epistemological pluralism" as described by Miller and colleagues (2008).

Ambrose concludes with a strong argument for using metaphors. One can also appreciate that he does not dismiss the limitations and challenges of interdisciplinary work. The Minsky-Weizenbaum disagreement on metaphors elaborates the possible tensions within a field - in this case, cognitive science. How can we allay the possible incongruities between disciplines? It is so well known in the academia that despite altruistic claims, tenure and promotion processes are rampant with disillusioned candidates who have been led to believe that teaching, research, governance, community contributions and cross-discipline expertise are desirable. Yet, when the actual process is scrutinized,

research dollars and "black-and-white" journal publications usually trump everything else. This of course, leads to the "publish or perish" syndrome. Ken McCluskey and Taisir Subhi Yamin describe the new format for Tenure, Promotion and Continuing Appointment being implemented at the University of Winnipeg (UW-UWFA, 2013).

This is another example of re-appropriation of the narratives by the periphery - the first step towards the migration of the margins to the centre. Indeed, the new approach allows autonomy and discipline-specific control, and yet, there is a strong sense of inclusivity and a non-mandated earnest desire for cross-discipline relationships to include other faculties and departments. This effort by clear volition is a testament to an inclusive process initiated at the behest of those who are being influenced by those changes.

This discussion focuses on the interdependency between researchers from various disciplines. A subset of discourse beyond this commentary relates to the teaching component within the domain of interdisciplinarity. Many educational institutions have developed specialized methodologies to recognize the value of such an approach. In considering interdisciplinary teaching approach within the context of teacher education, Jones (2009), raises the issue of time and energy. Nevertheless, he concludes that, "Students and their teachers will advance in critical thinking, communication, creativity, pedagogy, and essential academia with the use of interdisciplinary techniques" (p.5).

While this commentary may appear to be a persiflage, the intent is to raise some pertinent questions in relation to Ambrose's position on opening up, going beyond, transcending traditional borders, and reaching across disciplines to share, strengthen, and enrich the pursuit of knowledge. Historically, interdisciplinary scholarship has been misconstrued as lack of focus or expertise. Indeed, as Ambrose opines, interdisciplinary work should not be an excuse to compromise excellence and academic rigour. It cannot be used for lack of scholarship. If one could simply use the logic that a polyglot has definite advantages, it is akin to arguing for a interdisciplinary expert reaping the benefits of multiple fields of expertise. In the end, it is paramount that the production of knowledge should be authentic, relational and beneficial.

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**Commentary (13):**

# Crossing Disciplinary Borders in the Psychology of Creativity: An Exercise in Perspective-Taking

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In the target article, Ambrose (2015) makes a strong case for why crossing disciplinary boundaries can be a fruitful exercise for scholars working in gifted education and creativity. This commentary will focus primarily on the latter and explore the creative potential (but also potential pitfalls) of interdisciplinarity in the psychology of creativity, theorising it in terms of difference, perspective-taking, and reflexivity. The outcome: six (new) perspectives on creativity not as is but as it could be if we work to expand our conceptual horizon. In the concluding part we reflect on the usefulness of this exercise by adopting yet another perspective, a critical one, in order to understand where interdisciplinarity can take us but also where it might leave us as a research field.

**Keywords:** Creativity; interdisciplinary; difference; perspective-taking; reflexivity.

In the target article, Ambrose (2015) makes a strong case for why crossing disciplinary boundaries can be a fruitful exercise for scholars working in gifted education and creativity. This commentary will focus primarily on the latter and explore the creative potential (but also potential pitfalls) of interdisciplinarity in the psychology of creativity. It is worth mentioning from the start that we will consider here not only crossing boundaries between psychology and connected (or distant) disciplines, but also between sub-disciplines within psychology. This is because psychology itself is a highly heterogeneous field of inquiry, so diverse in fact that one can easily find scholars who share little common ground except the label of being 'psychologists'. Imagine, for example, the conversation between a phenomenologist and a psychometrician. And yet, it is precisely *because* they don't share much in terms of epistemology and methodology that these two, and many other psychologists, *should* talk to each other. This equally applies to the creativity scholar who might, in some ways, find it easier to talk to the psychometrician than the phenomenologist. How can we change this?

The present commentary doesn't have a definitive answer to this question but rather aims to make, concretely, the case for why borrowing insights from different disciplines and sub-disciplines enriches our field. These reflections are themselves born out of a continuous dialogue over the years between the two authors, across countries and, more importantly, across different areas of research and epistemological assumptions. It was, in fact, this very premise that encouraged us to continue our dialogue and to expand it. It is also the premise for our commentary. In a quick brainstorming session, the two of us considered what key

concepts from other disciplines we could 'import' into the psychology of creativity and with what effect. This type of play with terminology is something the first author has been exploring in recent years (see Glăveanu, 2013; Glăveanu, Tanggaard & Wegener, forthcoming). The basic idea behind it is that new concepts offer us a fresh entry point into the topic of creativity and, seeing creative phenomena through new conceptual lenses can inspire new directions for theory, method, and research alike. This 'creative' exercise certainly has limitations imposed by the knowledge and preference of each researcher. Dialogue is, therefore, invaluable.

Before we start presenting the outcomes of our conversation though, a bit of theoretical framing is required. One of the key reasons why the topic of multi-, inter- or trans-disciplinarity (with their different nuances, as distinguished by Ambrose, 2015) is so important for creativity research in particular is that it points to a process that not only can strengthen this field of research but it is also *part and parcel of the phenomenon* we are studying. If we understand interdisciplinary broadly as an exercise in crossing conceptual boundaries and opening up new ways of seeing the world, then this is precisely what creativity is about! As such, to continue Ambrose's argument, we postulate that creativity and gifted education scholars should consider the processes of interdisciplinary work not only for the sake of gaining new insights into creative phenomena but in order to experience them in their *own* work. One might wonder if all interdisciplinary work is creative but this question implicitly evaluates creativity by looking at outcomes. What we refer to here are processes. What makes collaborations across disciplinary boundaries necessarily creative in terms of process?

To understand this, one needs to consider the key concepts of *difference, position, and perspective*. Creativity finds its root in difference and difference itself (for example, between self and other, between the new and the old, between signs and objects) represents its condition of possibility (see also Glăveanu & Gillespie, 2015). However, this is a necessary but not sufficient condition. Taking the concrete example of interdisciplinary work, the fact that geology and psychology are different disciplines doesn't, in itself, make an encounter between a geologist and a psychologist creative. For all we know they might not even talk about their work, thus not reflecting on or exploiting their differences in knowledge and approach. Moreover, they might think there is nothing creative that can come out of dialogue because the difference is just too big (what do people and rocks have in common?). The positions from which they engage in knowledge production, defined in this case by their disciplines, are thus seen as too distant and thus too unrelated. What would the alternative imply? Creating a *relation* between different positions, not only that of geologist and psychologist but also, for example, male and female, child and parent, observer and observed, can only be done when we articulate their perspectives on reality. By perspective we mean, following Mead (1932) and neo-Meadian scholarship, 'action orientations' (Gillespie, 2006, p. 17) of the person or how, from a particular position (defined in social/institutional or physical terms) someone sees reality and, consequently, acts within it. In this sense, faced with an empirical problem, the geologist and the psychologist will arguably have different perspectives on it due to their differences in knowledge and method. However, even if they share with each other these differences in perspective, these will remain unrelated unless they engage in perspective-taking, the foundational human capacity to see the world from the perspective of another person or, more broadly, from another position. This process constitutes the social basis of creativity (see Glăveanu, 2015) and, we propose here, the mechanism that makes interdisciplinary collaborations fruitful (Cornish, Zittoun & Gillespie,

2007). To summarise, the fact that there are disciplinary differences we are aware of represents the condition of possibility for creativity but, in order for these differences to translate into creative outcomes, one needs to take the perspective of another (in our example, scholar or discipline) on one's topic. This is the starting point for our own 'creative' interdisciplinary exercise below.

What this exercise consists of is our attempt to take the perspective of scholars working in different domains, i.e., ecological psychology/design, literary studies, systems theory/ developmental psychology, sociology, climate research or even geology, and consider how creativity would look like to these scholars through the lenses of one key concept from each discipline[3]. The outcome: six (interdisciplinary) perspectives of what creativity is not yet but could be if we work to expand our conceptual horizon. In the concluding part we reflect on the usefulness of this exercise by taking yet another perspective, a critical one, in order to understand where interdisciplinarity can take us but also where it might leave us as a research field.

## Affordances

Creating links between affordances and creativity theory has been one of the concerns of the first author (Glăveanu, 2012, 2013), motivated by a noticeable lack of focus on materiality within creativity studies. Frequently discussed in terms of ideation (i.e., divergent thinking or other thinking processes), creativity is, however, first and foremost, a form of *making*, which both uses and produces material outcomes (even when it comes to performances rather than a concrete object, for example, in the case of dance). Furthermore, we are lacking a theory of how objects shape, guide, or constrain creativity that is not purely cognitive and considers objects in their materiality rather than their mental representation.

The notion of affordance can fill this gap. A clear illustration of interdisciplinary connections, this concept is associated with Gibson's (1986) theory of perception within a field of research that became known as ecological psychology. Today, this concept is very popular outside of psychology, especially in design studies (Norman, 1988, 1999) where the affordances of objects and especially how people perceive and make use of them is of primary concern. In psychology, this notion attracted perhaps less attention, on the one hand because of Gibson's rather vague (and also contradictory) formulation and, on the other, due to a persistent bias towards mental rather than material aspects.

> In Gibson's famous formulation:
> "the *affordances* of the environment are what if *offers* the animal, what it *provides* or *furnishes*, either for good or ill" (Gibson, 1986, p. 127)

In other words, affordances can be considered 'action potentials' and it is precisely this potentiality that brings them close to the notion of creativity (think, for example, about Unusual Uses Tests, based in fact on the principle of discovering new affordances for common items). For Gibson (1986), and in particular for the sociocultural scholarship that continued to elaborate his notion (see Costall, 1995), affordances are a relational concept pointing, at once, towards person and object. This is because uses of the object are afforded

[3] These are fields the two authors have been in contact with without claiming expertise in any of them. As such, it would be certainly useful in the future to expand the dialogue and include scholars actually working in these fields and not only.

not to everyone, but to those who have the physical and cultural attributes allowing them to notice and to act on what is afforded. To take a concrete example, chairs afford sitting. However, normal chairs don't afford sitting for an elephant due to its weight, nor would an elephant interpret them as objects to sit on due to the lack of such a mental representation. In other words, culture plays a big part in how we 'see' and understand our material environment; as Gibson (1986) once acknowledged, the mailbox affords sending letters only for those people who know about postal systems.

This raises a very interesting question for creativity scholars related to how *cultural normativity* mediates our relation to the material environment. If the canonical affordances of objects (Costall, 1995), meaning their primary use, is what we perceive most of the time, how can we become more aware of an object's full potentiality? Is this a classical case of 'fighting' our own culture and its norms in order to be creative? We argue this is not so because, just as discovering and acting on new affordances of objects is vital for creative action, so is making use of canonical affordances in conventional ways within the right context. Even if one discovered new sounds afforded by a violin, he or she could use them creatively only by integrating this new use with more conventional ones; to do this, he or she would need to be able to actually play the violin in an intelligible manner to begin with.

The concept of affordances and its usage in ecological psychology and design (as well as, more recently, human-machine interaction and artificial intelligence) could greatly enrich our creativity vocabulary (becoming one of the key A's of an extended creativity framework; Glăveanu, 2013). Creating interdisciplinary bridges in this regard would not only bring in materiality but, with it, culture. Just as more and more people talk today about a *material turn* in the social sciences (Hicks, 2010; Moro, 2015), it is time for creativity research to leave behind an exclusive focus on mental properties of the person in order to make room for the physical and the embodied. More active collaborations with designers and material culture experts can be very insightful in this regard.

## Heteroglossia

"Language is not a neutral medium that passes freely and easily into the private property of the speaker's intentions; it is populated – overpopulated – with the intentions of others. (…) forcing it to submit to one's own intentions and accents is a difficult and complicated process (...). As a living, socio-ideological concrete thing, as heteroglot opinion, language, for the individual consciousness, lies on the borderline between oneself and the other (...). The word in language is half someone else's. It becomes one's 'own' only when the speaker populates it with his own intentions, his own accent, when he appropriates the word, adapting it to his own semantic and expressive intention. Prior to this moment of appropriation, the word does not exist in a neutral and impersonal language (...) but rather it exists in other people's mouths, in other people's contexts, serving other people's intentions; it is from there that one must take the word, and make it one's own" (Bakhtin, 1992, p. 294)

The above is a quotation from Bakhtin's (1992) celebrated essays on the dialogic imagination. His notable contributions to literary theory and the philosophy of language have been appropriated by various disciplines today, including socio-cultural psychology and the theory of social representations (see Marková, 2003). However, his dialogical approach to language and the human mind are still to enter the psychology of creativity. Why is this the case? Almost two decades ago, Amabile (1996, p. 264) was of the

opinion that the social psychology of creativity is the least developed area within creativity studies. Unfortunately, there is not much progress in this area, at least in terms of visibility and impact, twenty years later… In fact, the role of the social within the creative process remains contested and depicted as marginal (see Runco, 2015).

In contrast, Bakhtin's (1992) approach, illustrated here, is that our language and, by consequence, our meaning-making, is intrinsically linked to Otherness. The language we use and the ideas we formulate are never individual in the sense of being produced by the isolated mind. They are acquired from a social and cultural world full of other people and respond to their intentions and utterances. This is the nature of *dialogism*, rarely considered before an essential feature of creativity (for an exception see Barrett, 1999). Creative acts are dialogical in a Bakhtinian sense; they are, indeed, 'populated – overpopulated – with the intentions of others'. Think, for instance, about the people we are in dialogue with, implicitly or explicitly, when creating something. These include our collaborators and, perhaps, our family as well as critics, mentors, even the general public. In this sense, Barron (1999) shrewdly noted that 'all creativity is collaboration'. Moreover, the materials we use to create, including the symbolic and linguistic elements that are fundamental for human creative expression, pre-exist us. They are embedded within history and culture and belong to others before we make them 'our own'. Perhaps Bakhtin (1992) himself would call creativity this very process whereby we make cultural elements, language being key among them, 'our own' through intentional use.

Heteroglossia (from Greek, *hetero* different and *glossa*, tongue or language) was for the great literary theorist the coexistence of different, often conflicting, types of speech within the novel (for example, think about the speech of the characters, of the narrator, and so on) and, by extension, within our common use of language, whenever we appropriate the words of others and make them our own. This concept points us therefore not only to an internal view of the social within the creative act (see also Glăveanu, 2015) but to a broader explanation for our creative potential. We are, at all times, using polysemic languages that make our mind polyphonic and dialogical or capable of holding different, including contradictory ideas or perspectives and, most importantly, capable of sharing these ideas or perspectives with others. An interdisciplinary study of heteroglossia and creativity would greatly contribute to socialising our view of this phenomenon and, ultimately, understanding the role of others within acts of creativity that, from the outside, appear to be the outcomes of personal, 'private' processes of the individual mind.

## Equifinality

In systems theory, equifinality designates the basic idea that open systems can reach the same end state by many possible means and these means define different potential trajectories (see, for example, Bertalanffy's, 1968, general systems theory). Due to this very general definition, the concept became popular in a variety of disciplines, from business and archaeology to psychology. It is, in fact, sociocultural life-course studies that we draw on here in an effort to connect the notion of equifinality with the psychology of creativity.

In recent years, a model has been proposed following this concept – the Trajectory Equifinality Model (TEM) (for details see Sato, Hidaka & Fukuda, 2009). This model focuses on how people develop over time and focuses in particular on people's relationship to the past that *was* and the past that *could-have-been*, as well as a future that is *not-yet-there*.

As such, TEM is also grounded in the idea of potentiality and openness specific for both affordances and heteroglossia. This makes it a very interesting candidate for cross-disciplinary exchanges with the field of creativity studies. It is to be noted however that, despite the existence of some developmental literature in the psychology of creativity (Feldman, 1999), the focus of most studies remains largely a-developmental (and sometimes alarmingly a-temporal). While a life-course perspective would certainly enrich our field, it is hard to imagine how the study of the life-course in its complexity (historical, social, and developmental) can fit today's outcome-based approach to creativity and creative potential.

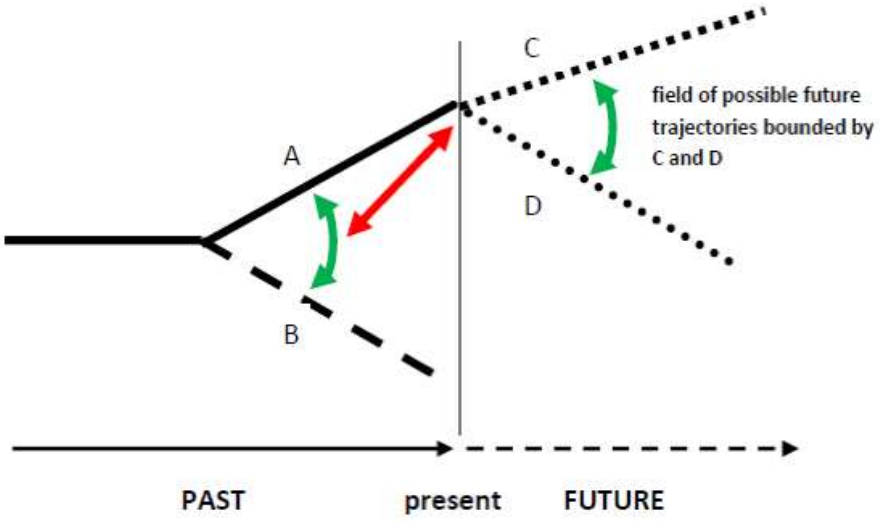


**Figure 1:** The basic structure of TEM (from Zittoun & Valsiner, 2015)

Figure 1 above captures the TEM approach to the life-course as an interplay between constraints and possibilities, between trajectories that are actualised and the alternative paths that populate both our past and our future and help us make sense of the present moment. Several *bifurcation points* are obvious in this illustration and understanding their role in constructing a life trajectory is fundamental for TEM. It could also inspire new work on the creative process conceptualised, in a similar manner, as a trajectory constantly being built in the present under the double constraint of the past and of the future. What has been done before sets the frame for our creative action, what will come guides it through the power of the imagination (Zittoun & Valsiner, 2015).

The notion of equifinality is important because it points to an often forgotten fact when it comes to creativity: studying processes reveals much more than focusing on the final product. This is not only because we get to have a forward-reading of creative action, based on how it unfolds (see Ingold & Hallam, 2007), but mainly because processes show us that there is never a single, final product to focus on. In the process of making or creating, alternatives of action are always considered in ways that constrain what is actually done and how. Equally, the outcome might very well be yet another bifurcation point within a wider trajectory. In this sense, the meaning of equifinality is not one of pre-determination, i.e., all roads take us to the same point. The reverse also applies: the same point has many potential paths emerging from it. Valsiner (2013) has long been discussing the *future-oriented* nature of human beings. Should creativity researchers take this concept seriously, they would

consider creativity not as the process ending in new outcomes but as a continuous movement of people and ideas within culture.

## Climate

Selecting climate as a cross-disciplinary category fruitful for creativity science may initially seem odd. After all, climate, especially psychological (Jones & James, 1979; Karwowski, 2013) or organizational (Glick, 1985), has been present in the social sciences for decades. At least since Lewin's famous lab studies (Lewin, Lippit, & White, 1939), psychologists were interested in the consequences of different psychological climates for a group's functioning, with several findings that are considered today classic. Also, in creativity studies, the literature on climate is rich and growing (e.g., Ekvall, 1996; Hunter, Bedell, & Mumford, 2007). Scholars are interested in the effects social climate can have on creative production and how we can improve creativity-enhancing climates.

As stated above, usually the concept of climate is used in a *metaphorical* manner. Creativity scholars are very rarely studying the effects of temperature, rain, or other strictly atmospheric phenomena on creativity; instead, they rather focus on the 'temperature' of the relationship between and among group members or classmates. They are not studying actual 'storms'; instead, they focus on tensions, i.e., conflicts, which are analogues with meteorological realities observed in their surroundings.

However, there seem to be quite direct, simple, and non-metaphorical relationships between several climate characteristics and creativity. Climato-economic theory (van de Vliert, 2007, 2008) assumes that climatic demands, together with the economic situation of different nations or regions, influence the functioning of people living in different parts of the world. This theory tries to clarify the special role played by climate in richer and poorer countries and regions. In the case of poor countries, harsh climates represent a threat; in rich ones, a challenge. In a recent study (Karwowski & Lebuda, 2013), we examined whether and to what extent these two mechanisms may be associated with the nation's creativity, measured by several indices of creative output. This research has shown that, although the level of creative achievement in poor countries is lower than in rich ones, a more interesting relationship is observed when it comes to climate itself.

As expected, in poorer countries, the harsher the climatic conditions, the higher the creativity observed. This reminds us of the saying: "necessity is the mother of invention". In rich countries, the relationship between climate requirements and creativity was curvilinear with the shape of an inverted U. Both extremely favorable and extremely harsh climates are not fruitful for creativity. The most conducive situation for creativity was observed when the level of the challenge was moderate. This pattern not only reminds us of several well-known psychological laws, but also fits quite perfectly with findings from schools or organisations.

A challenge that is too high is not necessarily good for creative output (Zhang & Bartol, 2010) or, at least, is moderated by other factors, like leadership styles (Jung, 2001) or group competency level (Halbesleben, Novicevic, Harvey & Buckley, 2003).

Climate research in creativity science will surely continue, considering the fact that this category proved useful in explaining differences in creative functioning. But is there anything else we can borrow and adapt from climate research within creativity studies? Can we consider it heuristically as a promising candidate for

cross-disciplinary creativity work? 'Creative tsunami' or 'flash' might sound more like advertising witticisms than scholarly concepts. But perhaps there are other categories which can be expanded and therefore, inspire us to look for alternative explanations when it comes to creativity-related phenomena. Potential candidates are '*drought*' and its conditions, the four '*seasons*' of the year with their circularity and weather characteristics, the '*crystallisation*' of water into ice during wintertime and vice versa in the spring. Feeling inspired by any of these?

## Emergence

Emergence has been explored within different disciplines and subdisciplines of the social sciences, and there is no place in this short commentary to discuss all its nuances and aspects (see Sawyer, 2005, for a more comprehensive discussion). In both classic sociological theories and contemporary theorising, the concept of emergence is built on the assumption that each system, formed from individual elements, is *not reducible* to these elements. Examples of systems include, but are not restricted to, societies, school classes, organisations and teams within organisations and, last but not least, people themselves. For creativity scholars, some consequences of thinking in terms of emergence are becoming very obvious today. It is widely accepted, for instance, that phenomena like *synergy,* referring to group work that is sometimes better than what may be inferred based on individual competencies, play an important role in creativity (Karwowski, 2009a). The creative output of more complex entities, like groups or societies, is hardly predictable on the basis of abilities or other characteristics of group members (Taggar, 2002; Pirola-Merlo & Mann, 2004). The effectiveness of the complex entity (e.g., group) may be higher than the sum of its individual increments (the role of synergy), but sometimes it may be lower as well. The latter effect is well known in social and political psychology, where research on groupthink comes from (Janis, 1982).

In light of this, any attempt to explain the creativity of a complex system, including individuals, needs to be, at least partially, emergence-based. Why does a group composed of creative individuals fail to solve a relatively easy problem, while groups composed of less creative individuals deal with it perfectly? Why are many students with high intelligence or well-developed divergent thinking abilities achieving very little in terms of creative output (Gralewski & Karwowski, 2012; Karwowski & Gralewski, 2013)? Emergence, or lack thereof, represents a plausible answer or explanation. Lack of coordination and added value in the interaction between different people's knowledge, skills, and habits (in the case of a group) or the poor coordination of individual's abilities, motivation, persistence and effort, are also natural explanations. In these cases, emergence refers not to a simple coincidence, but rather a kind of *synthesis and efficient cooperation* between and among different qualities.

## Transgression

In geology, the concept of transgression is associated with a slow, yet consequent activity of the sea, which gradually expands into the land. In the humanities and in social science, this concept, while sometimes applied, is typically used in the *negative* sense: transgression is considered in these cases either as a risk behaviour or, more broadly, antisocial behaviour (Dion, 1972). Foucault's works on transgression (see Foucault, 1980) inspired various analyses of 'differences' in this regard, related mainly to social class, but also gender, ethnicity, or sexuality.

It is much less known, however, that this very concept was already used to explain creative behavior (Kozielecki, 1986, 1987). A transgressive model of human beings assumes that the tendency towards transgression is a natural propensity for us and that every human aims at making transgressions. This very general assumption does not necessarily mean that the goal of every one of us is to behave creatively or cross boundaries. There are many different forms and levels of transgression (Kozielecki, 1986). The first important distinction is the one between positive and negative transgressions. Creativity is largely considered an example of positive transgression; crime or self-injuries are examples of negative ones. The second important distinction is between psychological (or P) and historical (or H) transgressions. Psychological transgressions, sometimes called also personal, are individually important; they are breaking habits or boundaries which are relevant from an individual's point of view. Historical transgressions are associated with changes influencing the life and reality of human beings in general. Importantly, these two dimensions, i.e., positive-negative transgressions and psychological (personal)-historical transgressions are independent, so at least four different categories of transgressions should be considered. First, there are transgressions which are both positive and personal. Overcoming the weaknesses of the body during intensive training could be considered as a positive and personal transgression but little-c creative activity (Karwowski, 2009b; Kaufman & Beghetto, 2009) applies perfectly to this category as well. Such transgressions don't have too much impact (or no impact at all) at the level of history, nor society as a whole. Nevertheless, they are psychologically important. Second, we can deal with transgressions which are at the same time personal (psychological) and negative. An individual's aggressive behavior or substance abuse are common examples of such transgressions; they might be, for various reasons, meaningful personally, but without any important influence on the wider, social reality. Third, positive-historical transgressions can not only change a field, like science or art, but can sometimes even change the definition of the domain itself (Sternberg, 1999). Big-C creativity fits perfectly into this category. Fourth and last, there are negative-historical transgressions, like the Holocaust or similar collective tragedies.

The framework inspired by transgression theory allows us to explain two clearly opposite phenomena, i.e., creativity and crime, using quite similar categories and concepts. According to this theory, people create or destroy because they are driven mainly by so called *hubristic motivation* (Kozielecki, 1986). This drive is, in part, conceptually close to achievement motivation but, additionally, much more focused on improving how others see the self and, essentially, ambition-based.

The rising popularity of studies into the dark side of creativity (Cropley, Cropley, Kaufman, & Runco, 2010) leads to an interesting presupposition. Perhaps the categories proposed by transgression theory are heuristically more promising in explaining different forms of creative behavior (both positive, but also those which are associated with the tendency to engage in crime) than explanations made to date? And, most importantly, is the metaphor of transgression, borrowed from geology, able to offer new insights which may be inspiring for creativity researchers?

For example, quite a natural candidate for such a mental exercise may lie in the quite thought-provoking question: Why are some seas more aggressively conquering land, while the others' effect is much smaller, even unrecognisable? Sea researchers would probably say that it is a complex issue determined by the relationship among climate, sea

characteristics, and the plasticity versus stability of the land under 'attack'. Doesn't this metaphor fit perfectly into research in our field? Why do some people create more incrementally, while others strongly prefer radical creativity (Madjar, Greenberg, & Chen, 2011)? Is this an effect only of their personality traits (Gilson & Madjar, 2011), and creativity-related beliefs (Karwowski & Lebuda, in press a, in press b) or also, even mainly, the effect of culture (Nowacki, 2013)? Isn't the social openness to creativity one of the crucial predictors of creative activity across domains, historical times, and geographical locations (e.g., Simonton, 1997)? At least some of these ideas, inspired by the metaphor of transgression, are well worth taking forward by creativity scholars.

## What to do with interdisciplinary perspectives?

In this short article we explored, briefly, the potential for enriching creativity theory when we consider it through conceptual lenses specific for other disciplines or other branches of psychology. Affordances, heteroglossia, equifinality, climate, emergence, and transgression are concepts we don't usually hear much about in psychology or those creativity studies focused on the properties of creative people or creative products. These concepts, on the contrary, point our attention towards *the social, material, and temporal context of creative processes*. As such, we consider them (and any other notions going in this direction), inspiring for new types of theorising creativity coming out of a closer dialogue within and across disciplinary boundaries.

However, while it might be tempting to keep on producing such new perspectives once we start reading more widely within other fields, the question remains of what we are to do with all these new ideas? Just as the creative process builds as much on divergent thinking as it does on convergent thinking (Cropley, 2006), it is not enough to generate (differentiate) new perspectives; we need a second, reflective step, leading to their *integration* (especially by relating them to existing perspectives within our own field). This is precisely where problems arise, particularly when it comes to interdisciplinary work. Since new perspectives tend to be rooted in the set of assumptions, both epistemological and methodological, of their discipline, the risk is to have in the end a collection of juxtaposed views on creativity with little *real dialogue* among them. For this dialogue to happen, and to be fruitful, one needs specialist knowledge and an increased sensitivity to epistemological issues, among other things.

This is the reason why, in the end, we argue that an additional, meta-perspective is required in interdisciplinary work and that is a *critical* one. This critical view is certainly meant to be constructive and facilitate the process of effectively 'moving' between perspectives in ways that lead to new outcomes (conceptually, methodologically, etc.). A critical perspective is also concerned, in our view, with the relationship between theory and practice or, better said, between theory and its practical implications. 'What is being done?' or 'What is achieved?' by following a certain theory are fundamental questions here. While scholarly work that crossed disciplines might be less committed, on the surface, to disciplinary politics, it is increasingly becoming fashionable to discuss and to promote interdisciplinary meetings between specialists and to build an ethos for this type of work. For us, however, successful interdisciplinary activities gain their strength and their benefits precisely *not* from collapsing perspectives into each other but *recognising* them as different (in the very process of putting them in dialogue). It would be very interesting in the future, whenever we use perspective-taking and reflexivity to discuss interdisciplinary endeavors, to critically reflect on the origin, nature, and consequences of such differences in concrete

settings. If creativity does indeed come out of difference (Glăveanu & Gillespie, 2014), then interdisciplinary work is best equipped to move our field further; it also gives creativity scholars a great opportunity to be creative themselves.

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**Commentary (14):**

# Learning Styles and Problem-Solving Styles of Talented Secondary School Students

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## Abstract

This study was conducted to investigate learning styles and problem-solving styles among secondary school students ($n$ = 105; mean age, 16.22). Teachers and coaches identified students talented in either, athletics, science, or the visual arts. Addressing styles can serve as a key component of instructional differentiation, so it is important to understand whether style differences exist within and among groups of students. Therefore, the purposes of this research were to examine students' styles in designated talent areas and the relationships between the dimensions of style indicators in order to make recommendations for selecting tools and designing instructional programs. Results supported the principle that the two selected instruments, VIEW: An Assessment of Problem-solving Styles and Building Excellence), yielded both common and unique insights into student characteristics, tested at the $p < .007$. Implications relate to the role of learning styles and problem-solving styles in individual differences and provide guidance for instructional differentiation.

**Keywords:** Talent development; problem-solving styles; learning styles; instructional differentiation

Differentiation of curriculum and instruction is a critical topic for educational research and practice today (Dunn & Griggs, 2007; Selby, Shaw, & Houtz, 2005; Tomlinson & Imbeau, 2010; Treffinger, Selby, & Isaksen, 2008). Although it has been defined in many ways in theory, research, and practice (DeBello, 1990; Rayner & Riding, 1997; Treffinger & Selby, 2009), style is one important factor in describing learner characteristics. This study dealt directly with two major approaches: *learning style* and *problem-solving style.* Learning style models and measures (e.g., Dunn, 2003; Rundle & Dunn, 1996-2008) involve an individual's preferences and promote successful performance when "learning new and difficult material." Problem solving style (e.g., Selby, Treffinger, & Isaksen, 2007) focuses on an individual's preferences when dealing with complex, open-ended problems and managing change.

Although these factors are relevant for gifted and talented education, previous research has not documented similarities and differences between the constructs of learning styles and problem-solving styles, or assessed their shared or unique contributions to talent domains. The present study was based on the hypothesis that possible style patterns of students from different talent domains could be used to enhance instructional differentiation. To examine these topics, we addressed the following research question:

What relationships are there between learning styles and problem-solving styles of a group of individuals across multiple talent areas, and specifically, among high school students with talents in athletics, science, or the visual arts?

## Learning style and problem solving style among adolescents

Learning styles offer individuals opportunities to recognize their strengths and encourage individualized instruction (Milgram & Dunn, 1993; Dunn & Dunn, 1993; Dunn, Dunn, & Treffinger, 1992). Researchers using the Dunn and Dunn model (Dunn & Griggs, 2003; Milgram & Dunn, 1993) have examined learning style preferences and learning outcomes in the K-12 environment (e.g., Lovelace, 2005), including different preference patterns for adolescents across talent areas (Dunn, Griggs, & Price, 1993), and creative disciplines (Honigsfeld, 2000). Regardless of achievement level or socioeconomic status, individuals have style preferences through which they can learn more effectively and efficiently than when they are unable to use their preferred styles (Burke & Doolan, 2006). The current model by Rundle and Dunn (1996-2008) consists of six strands (Environmental, Emotional, Sociological, Physiological, Perceptual, and Psychological; these are described in Table 1.

**Table 1:** The Building Excellence (BE) survey strands and elements.

| Strand | Element |
|---|---|
| **Perceptual**<br>One's preference or predisposition for learning and retaining new and complex information efficiently or skillfully | Auditory |
| | Visual picture |
| | Visual word |
| | Tactual |
| | Kinesthetic |
| | Verbal Kinesthetic |
| **Psychological**<br>One's inclinations for processing new and complex information | Analytic/Global |
| | Reflective/Impulsive |
| **Environmental**<br>Stress-related characteristics that affect one's ability to concentrate and focus on tasks | Sound |
| | Light |
| | Temperature |
| | Seating |
| **Physiological**<br>One's ability to remain energized and alert while completing school assignments or work tasks | Early AM |
| | Late AM Early PM |
| | Late Afternoon |
| | Evening |
| | Intake |
| | Mobility |
| **Emotional** | Motivation (Internal/External) |
| Preferences, which influence how one goes about completing challenging and complex tasks | Task Persistence (Multiple-tasking/Single-tasking) |
| | Conformity versus Non-conformity |
| | Structure (externally imposed structure or the opportunity to do things in one's own way) |
| **Sociological** | Alone |
| Preferred ways of learning and effectively interacting with others and consist of six learning style elements | Pair |
| | Small Group |
| | Large Group |
| | Authority |
| | Variety/Routine |

Research with the Dunns' model has addressed possible differences among groups of adolescent students. Dunn, Dunn, and Price (1996) administered the Dunns' Learning Styles Inventory (LSI) and a measure of creativity, the Tel Aviv Activities Inventory (Milgram, 1987), as part of an international study of gifted and nongifted adolescents in grades 7 through 12. Dunn et al. (1993) and Dunn, Griggs, Milgram, and Price (1997-1998) summarized the learning-style preferences of talented adolescents in the United States in science, dance, social leadership, music, drama, literature, art, or sports. The results indicated that for the adolescents who were creative in sports, science, or the arts, between 10 and 11 of the 22 LSI variables significantly discriminated between highly creative students and their less creative peers. In sports, highly creative ($n$ = 659) students showed preferences for working alone; parental motivation; kinesthetic, visual, and tactual modalities; self-learning; less sound; less authority; less variety; and intake. The noncreative students in sports consistently ($n$ = 316) preferred peer learning, variety in learning, the presence of authority figures, and sound (Dunn et al., 1993). Individuals who were creative in science ($n$ = 413) preferred formal design; working alone; less authority; high structure; low light and sound; and warmth. They were persistent, highly motivated and nonconforming. Their noncreative counterparts ($n$ = 551) were highly responsible, conforming, and preferred to have authority figures present. Highly creative art students ($n$ = 330) preferred tactual, visual, auditory, and multiple-modality strengths. Other preferences included bright light, learning in several ways, variety, less structure, less formal design, and less authority. Similar to the science students, they were highly motivated. Less creative art students ($n$ = 539) preferred an authority figure present, externally imposed structure, and formal design. These results indicate that differences existed between highly creative and less creative students; however, the study did not focus on differences between talent areas, only on differences between high and low creative students within domains.

Honigsfeld (2000) analyzed the learning-style preferences of 302 high-achieving and creative adolescents from five schools in Hungary. Students creative in various domains demonstrated significantly different learning-style characteristics as compared to their less creative peers. Comparing highly creative and less creative students, those students creative in sports preferred mobility ($p \leq .021$) and bright light ($p \leq .004$). The students creative in science showed preferences for the tactual style ($p \leq .0001$) and a high need for responsibility ($p \leq .0001$). Students talented in the fine arts preferred the tactual element ($p \leq .0001$) when compared to their noncreative classmates. This study highlights that there may be style preferences specific to students within talent areas, although talent group comparisons were not made.

Problem-solving styles deal specifically with individuals' preferences when defining and solving problems and managing change. Selby et al. (2004, 2007) defined problem-solving styles as “consistent individual differences in the ways people prefer to plan and carry out generating and focusing activities, in order to gain clarity, produce ideas, and prepare for action” (pp. 1-2). Their VIEW model consists of three dimensions and six styles: Orientation to Change (OC), with the Explorer and Developer styles; Manner of Processing (MP), with the External and Internal problem-solving styles; and Ways of Deciding (WD), with Person and Task styles. Explorers prefer novelty, less external structure, and greater distance from authority than those with a Developer preference. When working on a complex problem or managing change, Externals turn to others to draw energy and share ideas, while Internals first prefer to reflect on their own ideas before sharing with others. For individuals with the Person style, the need to create harmony and positive relationships is at the forefront, while those who are Task-oriented look first to the choices and decisions that must

be made to complete a given activity. Problem-solving style holds promise for increasing our understanding of how individuals, teams, and groups manage change and deal with complex, open-ended challenges.

Isaksen (2011) reviewed research on problem-solving styles among adults; there have been fewer studies with adolescents. In an effort to relate the choices adolescents can make in their lives with their problem-solving preferences, Crerar (2010; Crerar, et al., 2013) investigated the relationship between problem-solving style as measured by VIEW and career interests or preferences among 342 students in grades 8-11. Students with an Explorer style and those with an External style displayed a preference for the Kuder Sales/Management (Enterprising) Career Cluster. With respect to the Ways of Deciding dimension, those with a Person-Oriented decision-making style had a greater preference for the Kuder Arts/Communication (Artistic) Cluster and the Kuder Social/Personal Services (Social) Cluster, while those with a Task-Oriented decision-making style had a greater preference for the Kuder Outdoor/Mechanical (Realistic) Cluster and the Kuder Science/Technology (Investigative) Career. These outcomes indicate that there are problem-solving tendencies for students interested in the arts or science.

In a study of style preferences of students in mathematics, Matos-Elefonte (2011) compared the mathematics scores of the Scholastic Aptitude Tests to VIEW results for 40 high school juniors and seniors. Higher mathematics achievement corresponded to a Task-oriented decision-making style. In addition, a more Explorer style was positively associated with higher education goals.

Previous research suggests, then, that there may be emerging patterns of styles for students who are interested and achieving in specific domains (*cf.,* Delcourt, 1995). Since there has not been research to examine specific style patterns within and between talent areas, nor to compare multiple style models, the present study sought to address those issues for secondary school students talented in athletics, science, or visual arts regarding their learning style preferences and problem-solving styles.

## Methods and procedures

### Sample description and selection procedures

This study involved a sample of convenience drawn from three high schools with similar demographics in a New England state. The school districts were comparable with respect to socioeconomic status, race, and ethnicity distributions, and offered similar academic opportunities for students, as indicated in Table 2.

**Table 2:** School demographics and advanced placement (AP) information.

| | School A | School B | School C |
|---|---|---|---|
| **American Indian** | 0 (0.0%) | 3 (0.2%) | 0 (0.0%) |
| **Asian American** | 40 (2.4%) | 59 (3.5%) | 32 (3.2%) |
| **Black** | 17 (1.0%) | 12 (0.7%) | 5 (0.5%) |
| **Hispanic** | 46 (2.7%) | 43 (2.5%) | 12 (1.2%) |
| **White** | 1,585 (93.9%) | 1,586 (93.1%) | 938 (95.0%) |
| **Population (Grades 9-12)** | 1,688 | 1,703 | 987 |
| **Advanced Placement Courses Offered** | 18.0 | 20.0 | 18.0 |
| **% Completing Exam in grade 12** | 39.6 | 36.7 | 32.5 |
| **Students Taking Exam** | 150.0 | 341.0 | n/a |
| **% scoring 3 or more out of 5** | 76.6 | 92.2 | 80.9 |

**Note:** On AP exams, a score of three or higher is generally required for earning college credit.

The talent areas of athletics, science, and the visual arts were selected for three reasons: to provide contrast, and thus the least overlap, across a public high school curriculum (i.e., athletics, core academics, and the arts); to facilitate the identification process in schools with no formal gifted and talented programs, since there would be opportunities for students to excel in these areas through honors and advanced placement courses and competitions; and to afford the possibility for comparisons with results from former studies of adolescents (Honigsfeld, 2000; Milgram, 1987). Since none of the high schools participating in this research project had a gifted and talented program, the procedure used to select participants for the study was not employed to identify students for a particular program.

Talented students were sought from each high school via teacher and coach recommendations. First, science and visual arts teachers were asked to search for students in their classes, while athletic coaches/physical education teachers were asked to seek players on their team(s) who exhibited high levels of performance, engagement, and creativity. A researcher was available to explain the purposes of the study and to describe characteristics of talented students. Unfortunately, it is possible that the coaches could have missed recommending athletes who were not on school-related sports teams.

Second, after permission to participate in the study was obtained, each teacher or coach completed a talent rating form for every recommended student (Woodel-Johnson, 2010). Each form consisted of parallel statements representing above average ability, creativity, and task commitment based on Renzulli's Three Ring-Conception of Giftedness (Renzulli, 2005), one of the most frequent conceptions used by school districts to identify their gifted students (Callahan, Hunsaker, Adams, Moore, & Bland, 1995). The form used to rate Athletes contained 22 items with 9 task commitment, 5 above average ability, and 8 creativity statements. The Science form had 22 prompts: 9- task commitment, 6- above average ability, and 7- creativity. The visual arts form consisted of 21 statements that incorporated 8 task commitment, 6 above average ability, and 7 creativity items. Teachers and coaches indicated their degree of agreement with each statement using a 4-point Likert scale with responses ranging from strongly disagree to strongly agree. Items such as "Enjoys generating original ideas related to sport activities (creativity)," "Shows a sustained and intense interest in the science area (task commitment)," and "Comprehends new ideas easily in the visual arts (above average ability)," were included in the nomination forms. Each form was checked for content validity and inter-rater agreement by content area specialists in their respective talent domains. (Copies of the instruments for all three talent areas are available upon request from the first author.)

It was the researchers' intent to identify talented students in grades 9-12 with an equal distribution of participants from each domain under study. Recommendations were made and ratings completed during a 4-week period at the end of the academic year and into the beginning of the next academic year. This process resulted in a sample size of 74 from the late spring and 31 from early fall. The resulting 105 participants were secondary school students within an age range of 14 to 18 years ($M$ = 16.22). There were a total of 36 athletes (20 males and 16 females), 35 science students (15 males and 20 females), and 34 visual arts students (12 males and 22 females). The average rating, out of a possible 4.0, for each talent group was 3.8 ($SD$ = .33) for Athletes, 3.4 ($SD$ = .50) for Science students, and 3.8 ($SD$ = .18) for those recognized in the Visual Arts. The sample included 11 students in grade 9, 18 in grade 10, 52 in grade 11, and 24 in grade 12. One to 10 students were scheduled to complete the learning style and problem solving style assessments online during 30-minute nonacademic time blocks in a school computer room or library.

## Instrumentation

**Building Excellence (BE) Survey.** This study employed the Building Excellence (BE) survey (Rundle, 2006; Rundle & Dunn, 1996-2008) to assess learning style variables defined by the Dunn and Dunn (1993) model. BE is a web-based self-report measure used to obtain a comprehensive learning style profile, assessing 28 characteristics divided into six strands (see Table 1, above) to identify the learning styles of adolescents and adults; it requires approximately 25 minutes to complete.

The 5-point response format ranges from strongly disagree (1) to strongly agree (5), with a neutral response at the midpoint (3). Scores range from -100 to 100. Cronbach's coefficient Alpha internal consistency was .85 (Perceptual), .81 (Psychological), .70 (Environmental), .69 (Physiological), .74 (Sociological), and .83 (Emotional). The construct validity of the six strands and each of their components was determined through factor analysis (Rundle, 2006; Rundle & Dunn, 1996-2008), in which items with factor loadings of less than .4 were deleted. Evidence of construct validity can be found in the Building Excellence Survey Research Manual (Rundle & Dunn, 1996-2008). Sample items are available from the instrument's author.

Each BE element is scored on a continuous scale with higher values indicating a greater preference for a particular area. The anchor terms for most of the characteristics represent less of a preference (high negative values up to -100), an integrated preference (-25 to 25), or more of a preference (high positive values up to 100), except for the Psychological and the Emotional strands. On the Psychological strand, the analytic/global characteristic is interpreted by the following score values: strong analytic preference (high negative values), integrated analytic/global (-25 to 25), and strong global (high positive values). For all strands, individuals with integrated preferences can appreciate either preference related to an element, such as being able to process information using both an analytic perspective and a global one, or being affected by the element depending on the situation. In the latter case, for example, someone with a score of 0 for the Environmental element of quiet could prefer to have music playing when accomplishing certain tasks, but require silence to complete others.

**VIEW: An Assessment of Problem-solving Styles.** For this study, VIEW: An Assessment of Problem-Solving Styles (Selby et al., 2007) was used to assess participants' preferred approaches to solving problems and managing change, assessing three dimensions and six specific styles, as described above. VIEW is a web-based, self-report assessment for individuals from ages 11 through adult, and requires approximately 10 minutes to complete. Respondents select their preferences for 34 items, each involving a 7-point response scale, for which high or low responses indicate a preference for one of two styles. An example of the item format (but hypothetical in content, since the VIEW item set is restricted) might be:

*I prefer . . . working on a computer 1 2 3 4 5 6 7 working with pencil and paper.*

Responses of 1-3 would represent a preference for using a computer to complete work, a value of 4 designates no preference, and values of 5-7 indicate a paper and pencil preference.

The OC scale contains 18 items and there are 8 items each for MP and WD. OC scores range from 18 to 126, with a midpoint of 72. Scores below 72 indicate an Explorer style and scores above 72 represent a Developer style. Both MP and WD scores range from 8 to 56 with a midpoint of 32. Scores below the midpoint for MP represent an External preference, while those above the midpoint indicate an Internal style. For the dimension of WD, values below the midpoint indicate a Person style and scores above the midpoint represent a preference for Task completion. Of 24,458 subjects (ages 11-80+) worldwide who had responded to VIEW at the time of this study, 1,829 were students in grades 6-12.

The mean scores for the adolescent group in the master data set were 71.8 for OC, 29.6 for MP, and 33.2 for WD (Treffinger, 2011).

The VIEW inventory has test-retest reliability coefficients exceeding .70, as recommended by Gable & Wolf (1993), over time intervals as long as two years, and Cronbach Alpha reliabilities of .87 for OC, .82 for MP, and .84 for WD (Selby et al., 2007). Isaksen (2011), Selby, Treffinger, and Isaksen (2007), and Treffinger (2013) summarized the evidence supporting the validity of VIEW. Additional confirmatory factor analysis results have been reported by Proestler and Vazquez (2011). Two reviews of the instrument can be found in *The Seventeenth Mental Measurements Yearbook* (Schraw, 2007; Staal, 2007).

# Results

## Descriptive Statistics, Outliers, and Data Normality

Tables 3 and 4 present the mean and standard deviation for each variable. The assumption of data normality was examined using the values for kurtosis and skewness. All characteristics of the BE and the dimensions of VIEW met the criterion of ± 1 as recommended by Meyers, Gamst, and Guarino (2006), except for the BE element of Visual picture. A Shapiro-Wilk analysis was, therefore, conducted and met the pre-specified significance level of $p < .01$. (Tabachnick & Fidell, 2007). In another analysis checking the normality of this variable, the element had one score in the lower interquartile range (IQR). The data point was above ± 3.0, which is considered an extreme outlier (Meyers et al., 2006). Further analyses indicated that the results of the mean comparisons and the correlational analyses did not differ significantly with or without this case; hence, all participants remained in the study.

**Table 3:** Means, standard deviations and ranges for the elements of the BE.

| | Athletics (*n* = 36) | | | Science (*n* = 35) | | | Visual Arts (*n* = 34) | | | Total (*n* = 105) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Strand/Element** | ***M*** | ***SD*** | ***Range*** | ***M*** | ***SD*** | ***Range*** | ***M*** | ***SD*** | ***Range*** | ***M*** | ***SD*** | ***Range*** |
| **Perceptual** | | | | | | | | | | | | |
| **Auditory** | 12.50 | 40.09 | 175.00 | -1.43 | 42.74 | 137.50 | 5.51 | 46.28 | 175.00 | 5.60 | 43.02 | 175.50 |
| **Visual picture** | 34.72 | 40.10 | 200.00 | 36.07 | 35.33 | 162.50 | 53.68 | 28.46 | 137.50 | 41.31 | 35.78 | 200.00 |
| **Visual word** | 25.00 | 26.73 | 125.00 | 13.93 | 29.82 | 100.00 | 6.99 | 34.98 | 162.50 | 15.48 | 31.23 | 162.50 |
| **Tactual** | 27.43 | 31.60 | 137.50 | 15.36 | 27.13 | 125.00 | 43.75 | 35.25 | 150.00 | 28.69 | 33.25 | 150.00 |
| **Kinesthetic** | 27.43 | 34.95 | 137.50 | 15.71 | 28.82 | 137.50 | 25.74 | 41.74 | 175.00 | 22.98 | 35.53 | 175.00 |
| **Verbal Kinesthetic** | 51.04 | 24.71 | 100.00 | 42.14 | 24.83 | 87.50 | 53.68 | 28.29 | 125.00 | 48.93 | 26.18 | 125.00 |
| **Psychological** | | | | | | | | | | | | |
| **Analytic/Global** | -7.99 | 29.15 | 150.00 | 6.79 | 27.17 | 125.00 | 19.12 | 37.72 | 162.50 | 5.71 | 33.21 | 187.50 |
| **Reflective/Impulsive** | -13.19 | 38.95 | 150.00 | -9.64 | 41.80 | 187.50 | -12.13 | 55.18 | 200.00 | -11.67 | 45.28 | 200.00 |
| **Environmental** | | | | | | | | | | | | |
| **Sound** | -28.13 | 51.44 | 175.00 | -27.50 | 52.58 | 175.00 | -7.35 | 48.86 | 187.50 | -21.19 | 51.43 | 187.50 |
| **Light** | 2.78 | 62.33 | 200.00 | 3.93 | 54.21 | 200.00 | -5.51 | 56.76 | 200.00 | 0.48 | 57.52 | 200.00 |
| **Temperature** | -3.82 | 40.18 | 137.50 | -16.79 | 53.55 | 187.50 | -3.68 | 51.17 | 187.50 | -8.10 | 48.47 | 200.00 |
| **Seating** | 18.75 | 50.13 | 187.50 | 26.43 | 40.54 | 175.00 | -8.46 | 56.13 | 200.00 | 12.50 | 51.04 | 200.00 |
| **Physiological** | | | | | | | | | | | | |
| **Early AM** | 43.75 | 44.47 | 150.00 | -30.00 | 65.18 | 200.00 | -52.21 | 60.57 | 200.00 | -41.90 | 57.47 | 200.00 |
| **Late AM Early PM** | 7.64 | 49.40 | 162.50 | -4.29 | 51.44 | 187.50 | -8.82 | 55.69 | 200.00 | -1.67 | 52.15 | 200.00 |
| **Late Afternoon** | 26.04 | 46.71 | 162.50 | 3.21 | 53.06 | 200.00 | 11.40 | 48.30 | 187.50 | 13.69 | 49.87 | 200.00 |
| **Evening** | 7.29 | 59.34 | 200.00 | 18.93 | 69.75 | 200.00 | 15.44 | 67.77 | 200.00 | 13.81 | 65.25 | 200.00 |
| **Intake** | -3.47 | 48.61 | 187.50 | -8.93 | 53.00 | 200.00 | 4.04 | 49.88 | 200.00 | -2.86 | 50.31 | 200.00 |
| **Mobility** | 15.63 | 49.40 | 187.50 | -25.36 | 46.33 | 162.50 | -2.21 | 49.38 | 162.50 | -14.52 | 48.85 | 200.00 |

(continued)

| | Athletics (*n* = 36) | | | Science (*n* = 35) | | | Visual Arts (*n* = 34) | | | Total (*n* = 105) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Strand/Element** | ***M*** | ***SD*** | ***Range*** | ***M*** | ***SD*** | ***Range*** | ***M*** | ***SD*** | ***Range*** | ***M*** | ***SD*** | ***Range*** |
| **Emotional** | | | | | | | | | | | | |
| **Motivation (Internal/External)** | 15.28 | 28.68 | 125.00 | -6.43 | 20.19 | 75.00 | 9.93 | 23.99 | 100.00 | 6.31 | 26.07 | 125.00 |
| **Task Persistence (Multiple/Single)** | 40.97 | 27.97 | 137.50 | 28.93 | 42.20 | 200.00 | 26.84 | 40.37 | 150.00 | 32.38 | 37.45 | 200.00 |
| **Conformity** | 14.58 | 20.59 | 100.00 | -25.36 | 35.68 | 125.00 | -42.65 | 36.81 | 137.50 | -27.26 | 33.51 | 137.50 |
| **Structure** | 21.18 | 32.71 | 137.50 | -2.50 | 40.99 | 187.50 | -13.60 | 37.23 | 150.00 | 2.02 | 39.53 | 200.00 |
| **Sociological** | | | | | | | | | | | | |
| **Alone** | 35.07 | 49.45 | 162.50 | 47.86 | 39.82 | 150.00 | 44.85 | 45.97 | 150.00 | 42.50 | 45.19 | 162.50 |
| **Pair** | 30.90 | 38.44 | 150.00 | 9.64 | 49.45 | 187.50 | 9.56 | 43.53 | 162.50 | 16.90 | 44.73 | 200.00 |
| **Small Group** | -7.99 | 44.74 | 175.00 | -30.36 | 42.91 | 162.50 | -27.94 | 44.28 | 150.00 | -21.90 | 44.73 | 175.00 |
| **Large Group** | 62.15 | 41.13 | 162.50 | -69.29 | 39.34 | 150.00 | -58.09 | 46.35 | 150.00 | -63.21 | 42.17 | 162.50 |
| **Authority** | 11.46 | 40.90 | 175.00 | -15.71 | 50.94 | 200.00 | -2.94 | 48.37 | 200.00 | -2.26 | 47.75 | 200.00 |
| **Variety** | 26.04 | 36.52 | 137.50 | -30.36 | 35.91 | 150.00 | 1.84 | 40.96 | 200.00 | -18.45 | 40.06 | 200.00 |

**Table 4:** Means, standard deviations and ranges for the dimensions of VIEW.

| | Athletics (*n* = 36) | | | Science (*n* = 35) | | | Visual Arts (*n* = 34) | | | Total (*n* = 105) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension** | ***M*** | ***SD*** | ***Range*** | ***M*** | ***SD*** | ***Range*** | ***M*** | ***SD*** | ***Range*** | ***M*** | ***SD*** | ***Range*** |
| **Orientation to Change (Explorer/Developer)** | 74.39 | 19.66 | 80.00 | 72.11 | 20.92 | 90.00 | 55.79 | 18.74 | 76.00 | 67.61 | 21.28 | 95.00 |
| **Manner of Processing (External/Internal)** | 31.03 | 9.85 | 45.00 | 34.77 | 9.28 | 38.00 | 33.64 | 8.57 | 32.00 | 33.12 | 9.31 | 45.00 |
| **Ways of Deciding (Person/Task)** | 32.86 | 9.74 | 41.00 | 39.91 | 8.57 | 31.00 | 28.74 | 9.49 | 36.00 | 33.88 | 10.29 | 44.00 |

**Note:** Interpretation of mean scores is based on the following values: OC (low- 18, moderate- 72, high- 126); MP (low- 8, moderate- 30, high- 56); WD (low- 8, moderate- 33, high- 56).

## Learning styles and problem-solving styles of talented high school students

The research question addressed the comparison of students in the three talent groups with respect to the six strands of the BE, which contained the 28 elements, and the three VIEW dimensions (OC, MP, and WD). Using the PASW Statistics program (SPSS, 2009), the independent variable of talent area was used in each of the seven MANOVA procedures. One MANOVA analysis was conducted for each of the strands of the BE. Each strand had multiple elements used as the dependent variables: Perceptual (6 elements), Psychological (2 elements), Environmental (4 elements), Physiological, (6 elements), Emotional (4 elements), and Sociological (6 elements). An additional MANOVA procedure was analyzed using VIEW (3 dimensions). Since seven multivariate analyses were performed, a Bonferroni adjustment was made (Meyers, Gamst, & Guarino, 2006) using a $p$ value of .007 (.05/7).

Each Box M result testing the homogeneity of variance for the seven MANOVA procedures met the criterion of $p < .01$ (Tabachnik & Fidell, 2007). Significant main effects were found for the following three BE strands ($p < .007$): Perceptual (Table 5); Emotional (Table 6); and Sociological (Table 7). When interpreting results for partial eta squared, Huck (2012) suggests that "the lower limits for small, medium, and large are .01, .06, and .14, respectively" (p. 470). All multivariate results were, therefore, considered to be large. Multivariate and related univariate results are depicted in the same table. Using $p < .05$ for each follow-up analysis, there were group differences for the Perceptual elements of visual picture, visual word, and tactual; the Emotional elements of motivation, conformity, and

structure; and the Sociological element of variety. Significant differences among the talent groups for the BE strands are indicated in Table 8.

**Table 5:** Multivariate and univariate analyses of variance for the perceptual strand.

| | | | | Univariate | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Multivariate | | | Auditory | | | Visual Picture | | | Visual Word | | | Tactual | | | Kinesthetic | | | Verbal Kinesthetic | | |
| **Source** | $F^a$ | $p$ | $\eta^2$ | $F^b$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ |
| **Talent Group** | 2.5 | .004* | .14 | .93 | .40 | .02 | 3.1 | .048* | .06 | 3.1 | .05* | .06 | 7.1 | .001*** | .12 | 1.1 | .33 | .02 | 1.9 | .157 | .04 |

**Note:** [a]Multivariate $df$ = 12, 194. *$p$ < .006. **$p$ < .001. [b]Univariate $df$ = 2, 102. *$p$ < .05. **$p$ < .01. ***$p$ < .001.

**Table 6:** Multivariate and univariate analyses of variance for the emotional strand.

| | | | | Univariate | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Multivariate | | | Motivation (Internal/External) | | | Task Persistence (Multiple-tasking/Single-tasking) | | | Conformity versus Non-conformity | | | Structure | | |
| **Source** | $F^a$ | $p$ | $\eta^2$ | $F^b$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ |
| **Talent Group** | 4.5 | .001** | .15 | 7.5 | .001*** | .13 | 1.5 | .232 | .03 | 6.9 | .002** | .12 | 8.1 | .001*** | .12 |

**Note:** [a]Multivariate $df$ = 12, 194. *$p$ < .006. **$p$ < .001. [b]Univariate $df$ = 2, 102. *$p$ < .05. **$p$ < .01. ***$p$ < .001.

**Table 7:** Multivariate and univariate analyses of variance for the sociological strand.

| | | | | Univariate | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Multivariate | | | Alone | | | Pair | | | Small Group | | | Large Group | | | Authority | | | Variety versus Routine | | |
| **Source** | $F^a$ | $p$ | $\eta^2$ | $F^b$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ |
| **Talent Group** | 2.7 | .002* | .14 | .8 | .46 | .02 | 2.8 | .07 | .05 | 2.8 | .07 | .05 | .6 | .540 | .01 | 3.0 | .055 | .06 | 7.4 | .001*** | .13 |

**Note:** [a]Multivariate $df$ = 12, 194. *$p$ < .006. **$p$ < .001. [b]Univariate $df$ = 2, 102. *$p$ < .05. **$p$ < .01. ***$p$ < .001.

**Table 8:** BE strand Post Hoc comparisons for three talent groups: Athletics, science, and visual arts.

| Strand | Multiple Comparisons (Mean) |
|---|---|
| **Perceptual** | |
| Visual Picture | No significant Post Hoc differences |
| Visual Word | Athletics (25) > Visual Arts (7)* |
| Tactual | Visual Arts (44) > Science (15)*** |
| **Emotional** | |
| Motivation (Internal/External) | Science (-6) > Athletics (15)***, Visual Arts (10)* |
| Conformity | Visual Arts (-43) > Athletics (-15)*** |
| Structure | Athletics (21) > Visual Arts (-14)***, Science (-3)* |
| **Sociological** | |
| Variety | Visual Arts (2) > Science (-30)**, Athletics (-26)** |

**Note:** *$p$ < .05. **$p$ < .01. ***$p$ < .001. Total Sample: $n$ = 105; Athletics: $n$ = 36; Science: $n$ = 35; Visual arts: $n$ =34. The anchor terms represent less of a preference (high negative values), an integrated preference (-25 to 25), or more of a preference (high positive values).

Comparing the talent groups on the VIEW dimensions produced significant results (Table 9). Follow-up procedures indicated significant differences for Orientation to Change

and Ways of Deciding ($p < .05$). Differences among the talent groups are indicated in Table 10.

**Table 9:** Multivariate and univariate analyses of variance for the dimensions of VIEW.

| | | | | Univariate | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Multivariate | | | Orientation to Change (Explorer/Developer) | | | Manner of Processing External/Internal | | | Ways of Deciding Person/Task | | |
| **Source** | $F^a$ | $p$ | $\eta^2$ | $F^b$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ | $F$ | $p$ | $\eta^2$ |
| **Talent Group** | 6.7 | .001** | .17 | 9.1 | .001*** | .15 | 1.5 | .222 | .03 | 12.8 | .001*** | .20 |

**Note:** [a]Multivariate df = 12, 194. *$p < .006$. **$p < .001$. [b]Univariate $df = 2, 102$. *$p < .05$. **$p < .01$. ***$p < .001$.

**Table 10:** VIEW dimension Post Hoc comparisons for three talent Groups: Athletics, science, and visual arts.

| **Dimension** Anchor Construct | **Multiple Comparisons (Mean)** |
|---|---|
| **Orientation to Change** Explorer/Developer | Visual Arts (56) > Athletics (74)***, Science (72)** |
| **Manner of Processing** External/Internal | Athletics (31), Science (35), Visual Arts (34) |
| **Ways of Deciding** Person/Task | Science (40) > Visual Arts (29)***, Athletics (33)** |

**Note:** *$p < .05$. **$p < .01$. ***$p < .001$. Total Sample: $n = 105$; Athletics: $n = 36$; Science: $n = 35$; Visual arts: $n = 34$. Interpretation of scores is based on the following values: OC (low- 18, moderate- 72, high- 126); MP (low- 8, moderate- 30, high- 56); WD (low- 8, moderate- 33, high- 56).

## Discussion

This study addressed one principal research question about whether there were significant differences among secondary school students talented in athletics, science, or visual arts regarding their learning style preferences and problem-solving styles. The study served two broad purposes: examining evidence for the validity of the problem-solving style construct and measure, and exploring the educational implications of learning style and problem-solving style among students talented in three different areas.

The results for the research question indicated that there were significant mean differences between secondary school students identified as talented in athletics, science, or the visual arts with respect to learning styles and problem-solving styles. To summarize results for the BE strands, members of the Visual Arts group were the most tactual, the least conforming, and the most appreciative of variety, whereas, compared to their peers, Science students were more internally-oriented and Athletes preferred more structure. In addition, Athletes' preference for the visual word was significantly greater than that of their peers who were talented in the Visual Arts. Regarding VIEW, Visual Arts students displayed a significant preference for the Explorer style while Science students were more Task-oriented than either of their two peer groups.

Previous studies lend support for these results. Learning styles of adolescents were assessed across talent areas by Dunn et al. (1993), Dunn et al. (1997-1998), and Honigsfeld (2000). Their comparison groups consisted of creative and noncreative students within the domains of sports, science and the arts, rather than a comparison of talented students across domains. Although a comparison of results among the previous studies revealed no consistencies for the talent areas of sports or science, art students from both research projects

were more tactual, preferred more variety, and were less conforming than their peers. In Honigsfeld's study, the students talented in sports preferred mobility. While the mean for mobility in the present study was higher for Athletes than for Science or Visual Arts students, the difference was not significant. Honigsfeld also found that sports students preferred bright light, whereas Athletes in the present study demonstrated an integrated preference. Finally, while Athletes and Science students had an integrated preference for the tactual element, the Visual Arts students had significantly higher preferences for tactual processing than their peers. This result from the present study is in agreement with Honigfeld's findings.

Although there were no studies employing VIEW dimensions with a comparable sample, similar constructs can be found in the literature. In the present study, there were no significant differences between talent groups on VIEW's MP dimension, meaning that students were just as likely to have an Internal style as they were to have an External style. These results are in agreement with findings using Jungian models and measures, in which gifted and talented students were equally likely to be characterized as introverted or extraverted (e.g., Sak, 2004). While Science students were significantly more internally oriented on the BE than their peers, scores for all three groups represented an integrated preference with mean values ranging from -6.43 for the Science students to 15.28 for the Athletes.

## Implications for Education

The findings of this study suggest that both learning and problem-solving styles yield some common insights into students' preferences and needs across multiple talent areas. At the same time, the results suggest both differential insights from various style measures and within talent areas. Part of the "common wisdom" of gifted education is that high ability students need interaction with their intellectual peers. The results of this study suggest that it is also important to be aware of differences within and among specific talent areas. In addition to being aware of each student's general ability, educators need also to know of unique characteristics and preferred approaches to learning and problem-solving as well as differences that may occur for students with various talents. This is particularly true when styles are extreme, as indicated by the ranges of scores in Table 4. It is critical that students, parents, and teachers be able to assist an individual in understanding how he or she learns and relates to others.

For instance, when working in their talent area, visual arts students may use their nonconforming, exploratory preferences to excel in manipulating a variety of materials in unconventional ways, but they also need to adjust to the environment of their core curriculum classes. Both teachers and students need to develop strategies to adapt student learning preferences to situations outside of the art studio. For those students who are more internally-oriented, they should not only practice working with others, but need to understand the strengths and motivations of their more externally-oriented peers. It is also important to understand that some students can move between two preferences and should learn how to use this ability to their advantage. While the science students in this study had a stronger internal learning preference than their peers in Athletics or the Visual Arts as assessed by the BE, their mean score indicated that they had an integrated preference, i.e., that they tended to be internally- or externally-oriented, depending on the situation. This concept is in agreement with LaBanca's (2008) research about Intel science winners. He found that these students needed to work with external contacts to gather ideas and they needed time to process information internally. Besides learning how to use their strengths, students with specific preferences need to learn how to appreciate the preferences of others and to understand how to adapt their styles in order to collaborate with their peers. The results also point to the need

for educators to be aware of the varied characteristics and style preferences that exist within and across talent areas and to design instruction that will respond appropriately to their students' strengths, rather than assuming that high-ability students are completely homogeneous as a group and can thus be taught in the same way. The essence of differentiated instruction is responsiveness to the learner's actual characteristics and needs.

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**Commentary (15):**

# On "Borrowing Insights from Other Disciplines: Mandatory, Superfluous or Tangential?"

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**Keywords:** Gifted; gifted education; mentoring; enrichment; counseling of gifted; acceleration of gifted.

I am indeed honored to be asked to comment on Don Ambrose's very fine, well thought out, and comprehensively-cited paper entitled "Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundations for Gifted Education".

It is a quite robust, insightful paper that explores many issues of relevance - some of which will contribute to the grandeur and splendor of gifted education, and some of which will expand horizons for some of our somewhat narrow-minded colleagues.

Let me make some preliminary comments that have been mentioned in the past that bear repeating however. All research, all theorizing, all data collection occurs in some type of historical perspective. Data collection and theorizing in the 1950s was different than the 1980s and the year 2000. The main frame computer and standardized tests have all contributed to a more rapid, and on occasion, more pristine, more robust evaluation of data. Indeed, as I type, recent events have changed the panorama of education in America as we are confronted with high stakes standardized testing and the mass inclusion of students with special needs into the regular education classrooms, thus contributing to more heterogeneity than ever before.

Further, there have always been extraneous variables over which a scholar or researcher has no control. A researcher investigating race relations before Ferguson, Missouri, is apt to find different values, attitudes, philosophies, and even radically different thinking following the events in Baltimore, Maryland.

Does this relate to gifted education? Certainly, there are students in both of those communities who may have been impacted by those events in ways in which we cannot quantify.

Secondly, there is certainly a need to look at the social events and social structuring occurring in America and around the world. Yet these events are propelled by individuals, people, who have feelings, emotions, and motivations that are not necessarily easily quantified through some informal "focus group" or personal interview. The election of Barack Obama as well as the recent re-election of David Cameron in England cast different perspectives on each of these English-speaking countries, which may differ from the perspectives of Australia.

Thirdly, economic factors can taint research, simply by virtue of the fact that certain types of research are more steadily funded by foundations and governments. It is almost a well-known fact that in times of economic trials and tribulations that "gifted programs are the first to go" (I am not citing anyone here, it is basically common knowledge). Yet there are peaks and valleys when an excellent book comes along, such as Howard Gardner's "*Frames of Mind*" which seems to re-energize the field. The economy further controls the extent, the duration, the frequency, and the types of gifted services provided. Of recent mention are the Massive Open Online Courses (MOOCs) and on line classes (which some theorists abhor since the verbal banter, the give and take, the challenge, and the deep philosophical discussions do not always take place in these on-line classes or "Discussion Boards" (I would welcome some research on the Higher Order Thinking Skill challenges and Critical Thinking Skill challenges that occur on any high school or even college discussion board).

Politics, of course, plays an important role. Parents of children who might be visually impaired, hearing impaired or deaf, or have pervasive-developmental disorder or autism certainly have a right to advocate for their children. The politics of PL 94 - 142 continue today with continual questions as to the most appropriate placement for students with multiple handicaps or disabilities. There are local politics at the school board level, there are state politics and of course, at the federal level or the governmental levels in other countries such as Mexico, Israel, Germany, France, and so forth, each of whom contribute in their own specific ways to the nurturance and mentoring of gifted children. Some advocate for enrichment, yet there are those who question the depth, breadth and scope, and comprehensiveness of so called "enrichment programs" (Shaughnessy and Waggoner, 2015). There are, as far as I know, no enrichment programs that follow the excellent advice of Don Ambrose to borrow not just insights, but in depth comprehensive readings of other scholars, and other disciplines to not just strengthen the conceptual foundation, but to truly delve deep into the realm of human accomplishment as did Murray (2009).

The current zeitgeist, as correctly pointed out by Don Ambrose is one of high specialization. There are very few Renaissance men or women who know history, philosophy, religion, art, music, theatre, and the various realms of liberal arts, not to mention genetics and brain science. Granted, it does take time, reading, study, and encyclopedic knowledge and depth and breadth and scope to even minimally master Western Civilization, much less British literature, Russian art, German music, and African dance. The true scholar is so well read and so widely read that their skills are apparent as they appropriately cite and quote from Dumas, Hesse, Cervantes, Tolstoy, and integrate not just comments about Bach, Beethovan, Brahms, and Puccini, but do it in a cogent, coherent manner.

There are certainly cogent insights that can be rapidly quoted from other disciplines to encourage readers to delve deeper to procure greater understanding of events. Arnold Toynbee, Merton, Weber, and others all have contributed to the ebbs and flows of what has transpired in the world. Certainly the various wars that have been interspersed by times of peace continue to impact societies around the world.

Yet, how far can a scholar reach, particularly in a brief research note or piece in a journal. We can shine "new light on high ability" but we have to take it in context of talent, creativity, or intellectual prowess. Any single topic could be explored from a multidisciplinary perspective or an inter-disciplinary or even a transdisciplinary perspective. The importance and relevance of the topic must be carefully examined. One can attempt a

topic such as intelligence or cognitive assessment or simply the learning of piano skills. There have been scholars in the past who have been capable of such efforts. Silvano Arieti, Rollo May, Clyde Kluckhohn, and others have found that "exquisite balance" of attempting to integrate Greek mythology with modern psychology as in the case of Rollo May. Albert Ellis had for many years integrated the philosophical tenets of old with his contemporary psychology theories.

As with any examination of any realm, one must decide to examine the product (the music, the book) or the process (the creative process) or the personality of the creative individual (Van Gogh versus Dean Keith Simonton) or the person themselves (Viktor Frankl and Primo Levi, both survivors of the concentration camps).

Delving into these realms raises the question of objectivity and subjectivity, whether it be hard science versus soft science, the humanities versus biology and chemistry and medicine. The realms of different research endeavours to use one or more of the following: questionnaire or "Survey Monkey" (I wonder who dreamed up this moniker? ) or case studies or quasi-experimental or naturalistic observation (in the case of the Forest People). As Don Ambrose correctly structures this Pandora's Box, we have a realm of "mechanistic precision and predictability" versus "ambiguity, imprecision, and uncertainty". But have not some scientific advances simply come from observation of a Petri Dish or in Piaget's case, his observations of his children? All the while, these things occur in a political, social, and cultural world. Ultimately, there are vast differences in opinion as to what "giftedness" means in the short run and in the long run. (I will not discuss the dearth of long-range studies that Paul Torrance used to conduct. No one comes close to his longitudinal studies today).

I like Don Ambrose's phrase "traveling in the terrain of multiple disciplines". This is something that the Internet, e-mail, SKYPE and these various technologies have allowed us to do. I have personally conducted cross-cultural research with Finland, South Korea, and other countries. Granted, it is somewhat time consuming, and there are translational concerns, but it can be done, and some of the research bears out what scholars have already hypothesized.

Sometimes these complex issues can be boiled down into one word, that those in gifted education readily recognize, and that word is synthesis. The grand theorist is able to take from not just disciplines but from smaller realms such as ethics, religion, chaos theory, and so on. It is the true Renaissance writer, be he or she man or woman who is able to integrate, to synthesize, and to evaluate the writings of both past and current thinkers, philosophers, and scientific researchers. Could it be that we are not really encouraging and mentoring for these kinds of thinkers, or are the scholars of today forced into some small box or realm of such minuscule relevance, that our grand schemes and theories drivel and dry up in the desert of despair. We need to evaluate the thinking of some of the scholars that Don Ambrose has cited, one in particular, Roland Persson, who cautions us that gifted education seems to be dominated by "American cultural assumptions."

We should indeed look to other countries around the globe, such as Japan, Mexico, India, China, and to glean their perspectives and to learn from their leading thinkers and scholars, and not to be dependent on the latest ideas from the U.S.A. We need the cognitive diversity and the intellectual cross fertilization that comes from listening to and reading the works of other scholars who may also be advocating for inter-disciplinary study or encouraging it or the writing of it.

Certainly, there are problems with interdisciplinary work as Don Ambrose so cogently and clearly points out. Becoming an "expert", such as Bobby Fisher or Boris Spassky in chess, takes years. John Bear (year[s] and Howard Gardner (year[s] have examined these issues thoughtfully.

In closing, I can only suggest that we can all benefit from first reflecting on what Don Ambrose has proposed. Secondly, we can use his piece as a foundation for future work by procuring the primary source material that he has referenced in his paper, and then lastly, by thinking seriously as to what needs to be done to encourage this type of enrichment and intellectual cross fertilization in the schools around the world. We can all continue to set aside time to read the great books, and to seek out the new great research being conducted and then attempt to synthesize and to integrate these materials, thoughts, and research results into a truly rich, robust magnus opus of our own and then go on to make sure that not only are students getting the identification that they need, the acceleration that they need, but perhaps most importantly, the inter-disciplinary enrichment that they need and deserve.

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**Commentary (16):**

# The Gift of Interdisciplinarity: Towards an Ability to Think across Disciplines

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*They didn't know it was impossible so they did it.*
Mark Twain

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Don Ambrose's "Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundations for Gifted Education" provides an opportunity for reflecting on both the potential and difficulties inherent in interdisciplinary research. In effect, the different ways of conceiving giftedness as an object of interdisciplinary research can inspire challenges and ways of thinking and doing in other disciplines or pluridisciplinary fields of study. Although psychology and education remain the central disciplines involved in the study of giftedness and gifted education, Ambrose rightly extends the range of disciplines affected by the complexity of this issue. The disciplines related to this topic to a greater or lesser extent are: anthropology, ethics, philosophy, history, economics, and sociology. The multidimensional complexity of giftedness necessitates an open and holistic perspective that cannot be reduced to a single disciplinary root. The ability to open up to other disciplines and to disciplinarity as an entirely separate object of reflection is the focus of this article.

Interdisciplinarity is an epistemological, theoretical, and methodological issue that exists both within numerous disciplines and can be studied across them (Darbellay & Paulsen, 2008; Frodeman et al., 2010; Klein, 1990). In turn, interdisciplinarity fosters theoretical and practical advances in a particular field of study, in this instance studies of giftedness. The following questions arise in this regard: What are the specific challenges of interdisciplinarity and what is the nature of these processes involving the decompartmentalization of disciplinary boundaries? In this context of relative indisciplinarity what role does the idea of *discipline* still play in relation to disciplinary imperatives? Does engaging in interdisciplinary research represent an opportunity for researchers to make use of and/or develop cognitive abilities and original practices? Is interdisciplinarity a fashionable and automatic approach that all disciplinary and non-disciplinary researchers practice without difficulty, or does it require certain talents and specific skills? I will give priority to this second exploratory approach. I will also attempt to demonstrate that it is not the function of the interdisciplinary researcher to be at the service of the established disciplines and accompany their internal advancement. Instead, I will try to show that the interdisciplinary researcher has surpassed this ancillary position considerably to creatively develop abilities, concepts, tools, and methods that enable the interdisciplinary researcher to go beyond disciplinary limits and to produce new knowledge.

Although the majority of researcher profiles remain rooted by necessity and moreover, entirely legitimately, in a "home" discipline, something that makes sense in an academic context organised on a disciplinary basis, the fact remains that transgressive practices are also emerging and driven by researchers who are distancing themselves intentionally from the security of the discipline with a view to inventing new ways of thinking.

To echo the quote from Mark Twain presented as an epigraph to this article, this pioneering spirit, characterized by risk-taking, is found in scientific practice. Indeed, despite the fact that it would appear difficult or even impossible to implement at times in view of the resistance to change that it faces, it is practised on an everyday basis. The interdisciplinary researcher is without doubt a pioneer who proclaims a new way of producing knowledge without creating an additional discipline. The interdisciplinary researcher is akin to the aviation enthusiasts of the late 19th and early 20th centuries who, through their successes and failures, helped to write the first page of aviation history (Nova, 2011, p.10).

With a measure of ignorance, considerable confidence, extreme perseverance and a healthy appetite for risk, early aviators invented ingenious machines, prototypes of winged cars, gliders and vehicles mounted on giant umbrellas fitted with engines. Through the adventures that are recounted with delightful humour in the opening sequence of Ken Annakin's 1965 film *Those Magnificent Men in their Flying Machines or How I Flew from London to Paris in 25 Hours and 11 Minutes*, explorations and productive failures were transformed into successes. Although nobody is obliged to achieve the impossible (*ad impossibilia nemo tenetur*), we sometimes encounter innovators who make the impossible possible. This talent consists of innovating beyond disciplinary conformism by adopting a "Why not?" attitude. Bachelard (1934) decoded innovation in three complementary stages: it involves starting from the central idea of disciplinarity to demonstrate the advantages and limits, from which the conditions associated with its exceeding are revealed; once the threshold of a discipline has been crossed, it is possible to update a variety of interdisciplinary researcher profiles which are reflected in a desire to go beyond disciplinary boundaries. Beyond this variety of identities and practices, I will also pinpoint some of the abilities required to allow free rein to interdisciplinary talent as a high creative potential.

## Crossing the disciplinary threshold

The process of the disciplinarization of knowledge is an intrinsic aspect of the history of the modern university which contributed to the fragmentation and division of the disciplines which make up the scientific field in its entirety. This specialization movement offers relative autonomy to each institutionalized discipline. The latter represents a sub-space, within which a community of disciplinary researchers is distributed. These researchers control each other and themselves in such a way that they maintain the effect of the enclosure of their intellectual territory (Becher & Trowler, 1989). In fact, the researchers acquire and reproduce a "disciplinary habitus" (Bourdieu, 2001, p. 86) that regulates ways of thinking about the concepts and methodological skills characteristic of a given scientific community. This process of habituation to good disciplinary practices is the bearer of a symbolic value that lends it a certain "hypnotic power" (Bourdieu, 1998, p. 48), with which the members of the discipline identify through self-hypnosis and a more or less homogenous group spirit. The attempts at differentiation and identification with other disciplinary groups may be penalized through a call to order compliant with the principle of conformism.

The pupil or disciple (*discipulus* in Latin) is a person who follows a master and displays allegiance and obedience. A disciple submits to the need for the 'discipline' (*disciplina*), the whip of cords or chains used as an instrument of penitence, control and self-discipline. This spirit of disciplinary concentration, which is entirely legitimate and strongly legitimized in university institutions, is necessary for the development of knowledge within all disciplines and, at the same time, generates a proportional inability to give consideration to other points of view and/or problems that lie outside the disciplinary field of vision. In this case, strict disciplinarity is akin to a kind of "inattentional blindness" described by Mack & Rock (1998) and further exemplified by Chabris and Simons's (2011) invisible gorilla in *The Gorilla Experiment*. In this test of selective attention carried out with the help of a short video, the task consists in counting the number of passes made among three players from a basketball team wearing white t-shirts playing in the same space and at the same time as another basketball team of three players in black t-shirts and also playing among themselves. In principle, the test subjects manage to find the correct answer, i.e. five passes, without any major difficulty. When the video voice-over follows up with the test subjects by asking them whether they have seen the "gorilla", a considerable number of them are surprised and find themselves caught unaware (In general, 50 percent of the test subjects do not notice the gorilla). When the video is replayed, a person disguised as a black gorilla beating his stomach and slowly crossing the field of vision is very plain to see. The attentional focus on the players in white t-shirts completely eliminates the visual evidence of the gorilla's passage that dominates the action when viewed on screen. The experiment suggests that strong concentration on a particular task generates a blind spot and makes people block out an essential and highly original element of the experience: they fail to notice a perfectly visible stimulus. In the cognitive field, the problem is not inattention. The conspicuity of an object, idea, concept or method that is likely to attract attention in the cognitive field is dictated by the excessively disciplined view of the researcher who deploys almost all abilities in fulfilling a single routinized task. By the same process, hyperdisciplined researchers stop themselves from perceiving theoretical or practical elements of one or more other disciplines existing alongside their own—even when an interdisciplinary perspectives and reflection could potentially enable advancement in their own field.

The intention here is not to denigrate disciplinary effort, necessary for the development of knowledge, but to illustrate the fact that this mode of knowledge production is not the only one. It is necessary but insufficient in that it does not represent the diversity of research practices located between and beyond disciplinary divides. Of course, the threshold of disciplinarity should, be developed; however, it should be simultaneously reflected on and exceeded.

## The diversity of researcher profiles

The disciplinary researcher is productive and largely valued in the university context. However, this is merely one researcher profile among other possible ones that are admittedly less significant in terms of quantity. This observation was confirmed by a research study I conducted in the Swiss university context, *Analyzing Interdisciplinary Research: From Theory to Practice* (Swiss National Science Foundation, application n° CR11I1_143816, 2014-2015). This multiple case study involved the analysis of interdisciplinary research practices in various fields (ecology, ethics, health, sustainable development, digital humanities, medicine) while focusing particularly on the way in which interdisciplinarity is implemented by researchers in different academic contexts. Ten university centres or laboratories were selected for participation on the basis of their acknowledged involvement in interdisciplinary research in Switzerland. A total of 66 selected researchers in these 10

centres participated in the survey that was based on a mixed methodological filtering mechanism involving mainly qualitative methods. The survey included a questionnaire (65 respondents), semi-directed interviews (30, i.e. three per case) and one focus group per case (10 focus groups involving between four and seven researchers).

The selection of the survey participants took into account the criteria of differences in academic status, disciplinary affiliations, gender, and age. Without going into the details of the results of this research project that covered the multiple dimensions of interdisciplinary work (institutional, theoretical, epistemological, methodological, collaborative, publication, and evaluation of research), I would like to highlight one of the study's analytical dimensionsconcerning the researchers' reflections regarding their disciplinary affiliation and identity when undertaking disciplinary research. Our study succeeded in demonstrating a seemingly contradictory tension between relatively stable and institutionally acknowledged disciplinary identities, on the one hand, and more hybrid and mobile interdisciplinary identities that have yet to gain any form of academic recognition, on the other. Having established the sometimes paradoxical effects of the researchers' identities, we recognized different types of identity profiles ranging from that based on the claimed affiliation to a single discipline to more interdisciplinary and even indisciplinary profiles.

This gradual categorization does not make any claim to being exhaustive or to covering all cases that could arise along the broad spectrum of experience of interdisciplinary research. Instead they are prototypical profiles in the sense of the theory of the prototype (Rosch, 1973), whose practitioners should be considered as more or less representative. Indeed, the affiliation to a given profile or profiles should be understood in terms of a "more or less" rather than "all or nothing" logic. These profile types may be identified, as follows, on a continuum ranging from disciplinarity to indisciplinarity (Sedooka et al., 2016). The first profile is the relatively traditional one of the disciplinary researchers: (a) who explicitly display their affiliation to a recognised academic discipline (sociology, psychology, medicine) while also engaging in an open dialogue with other disciplines. The spectrum then broadens to include those researchers who make an explicit claim to adopting an interdisciplinary approach without presenting a single pre-established disciplina

ry identity. Here we can identify the hybrid profiles (b) of researchers whose academic trajectories result in the intersection of two or more former disciplines (for example, psycho-sociology or socio-anthropology). These researchers also establish themselves on the basis of a new (inter-)disciplinary identity through the hybridization of two or more disciplines. Pushing this breakdown of disciplinary boundaries further, it is possible to identify increasingly – in particular among young researchers – a thematic profile type (c), in which the researchers do not identify with a discipline but a thematic field of interdisciplinary studies that often cuts across several disciplines or sub-disciplines (for example gender studies, migration studies, visual studies, giftedness studies). Rather than follow a more traditionally disciplinary academic trajectory, these scholars allow their thematic focus of interest to direct their research, teaching, and publication activities. In the same vein, a new researcher profile is emerging which we designate as (d) "interdisciplinary natives," in the sense that its practitioners develop an interdisciplinary trajectory without any fixed disciplinary roots and their studies are carried out in scientific fields which include a broad range of different disciplines. In a way, these researchers were born within and with a culture of interdisciplinarity. Without limiting ourselves to an age or generation

effect, it is also possible to identify a complementary profile of migrant researchers (e) (interdisciplinary migrants) who are well-recognized and have an established original discipline but progressively open up to interdisciplinarity through borrowing, circulation and transfer between the disciplines over the course of their academic careers. In effect they construct their identity through changes and transformations from one discipline to another, successive migrations, and conceptual, theoretical and methodological nomadism (Andler & Stengers, 1987; Darbellay, 2012). At the extreme end of this spectrum of the different profiles that deploy variations, transformations, and repositionings of varying degrees of originality with respect to disciplinarity, we have, finally, the indisciplined researchers (f), who work resolutely outside of all disciplines and try to avoid all disciplinary sclerosis (Legay, 1986; Loty, 2005). They defy disciplinary boundaries with a view to enfranchising and liberating themselves from the disciplinization of knowledge.

These different profile types, identified here for exploratory purposes, contribute each in their own way to the defence and illustration of the interdisicplinary work necessary for the production of new knowledge. They are embodied in the trajectories of researchers who live the identity-based paradox on an everyday level, a process that involves existing within one's own discipline, interdiscipline, or indiscipline while remaining open to the other. Testimonies from researchers surveyed demonstrate the plurality of disciplinary identities that exist within interdisciplinary research practice conceived as dynamic, individual, and collective processes. Finally, the (inter-)disciplinary identities of the researchers are defined at the intersection of different parameters: from their basic education (disciplinary, bidisciplinary, multidisciplinary, or interdisciplinary) to their theoretical and methodological skills, the specific details of their academic and professional trajectories, and their personal interests. As it emerges and exists the identity of each researcher is shaped by many internal and external variables. Between similarity and dissimilarity, the question arises about what basically enables these different profiles to be similar in the sense of a family resemblance. What are the shared values, abilities, and characteristic cognitive operations practised by all researchers who are located in, between, and beyond disciplines? How would they allow us to outline an ideal type or meta-profile of the interdisciplinary researcher who would manage to express high potential for scientific creativity, and therefore participate in the renewal – or re-establishment – of complex fields of study like giftedness as explored by Ambrose and others?

## Interdisciplinary talent, innovative abilities

The consideration of the abilities specific to interdisicplinary work is linked in part with the need to educate new generations of researchers who are open to engaging in complex thinking with a view to solving theoretical and practical problems that cannot be dealt with from a monodisciplinary perspective (Lyall & Meagher, 2012; Stokols, 2014). It is not a question here of providing a reference work or exhaustive list of the required and standardized abilities, but of presenting some transverse abilities conducive to interdisciplinarity, taking into account the epistemological and institutional obstacles that still arise very frequently on the paths of researchers who take the risk of venturing beyond disciplinary limits. Apart from motivation and courage, the following three aptitudes characteristic of interdisciplinary researchers may be noted here:

- the taking into account of the complexity of the theoretical and practical problems to be resolved;

- an ability to move away from a disciplinary point of view and share the values of openness, empathy, and tolerance; and, finally,
- an aptitude for creative work which enables the invention of new concepts, theories and methods.

Complexity, values, creativity – these are the three core concepts used for outlining a prototypical meta-profile of the interdisciplinary researcher.

## Complexity

As Ambrose correctly reminds us, it makes sense to draw all of the conclusions from the evidence clearly demonstrated by the theories of complexity. If you define a biological, psychological, social, or anthropological object of study as a complex system, you start from the – observation-based – principle that the object or phenomenon is composed of different parts or variables that interact constantly. The object is considered as a plural and dynamic totality that cannot be reduced to the simple addition of its parts. It constantly changes through contact with (psycho-socio-anthropological) contextual elements and presents emerging properties.

For example, if we consider giftedness as a complex phenomenon, we establish an epistemological basis from the outset, according to which several variables (genetic, individual, collective, social, historic) interact in a non-linear manner of thinking. A holistic and integrated understanding alone will enable us to capture, describe, and understand the links constructed among these multiple dimensions. In this context, the researcher – or group of researchers in a collaborative variant of interdisciplinary research – cannot reduce giftedness to one of its constitutive dimensions. This epistemological rigour should be maintained throughout the research process while avoiding any eventual regression into disciplinarity that would involve the re-fragmentation of the object of study to focus on just one of its dimensions. In effect, epistemological pluralism is the guarantee of the diversity of disciplinary points of view deemed relevant and that should be activated together for tackling complex problems.

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The interdisicplinary researcher, who is endowed with great sensitivity to cognitive diversity (Page, 2007, 2010), could be described as a polymath who is capable of mastering a series of disciplinary inputs and integrating them into a holistic vision. Metaphorically speaking, the interdisicplinary researcher could be related to the chameleon that has the ability to adapt to a new environment by transforming itself to enter the system. Through differentiation, the disciplinary researcher develops in the specialized area in a targeted way. The specialist, who displays less adaptive ability in moving away from a field of specialization compared with the non-disciplinary researcher, can develop optimally in a university environment that is entirely beneficial but encounter difficulties in the face of complex and multi-dimensional problems that cannot be reduced to a monodisciplinary point of view. Without espousing to a primary and caricature-like Darwinism, the strictly disciplinary researcher evokes images of the panda, koala, or anteater, whose hyperspecialization reduces its chances of survival when the problems to be solved become more complex due to diversification (Durand, 2008). For example, the panda finds itself at an evolutionary impasse due to the excessive specialization of eating only bamboo. Although the panda does not have many rivals for this food source in its own territory, it is highly dependent on the forest context that surrounds it and is threatened

with extinction in the event of food source scarcity. Similarly, the koala only eats a certain kind of eucalyptus leaf and the giant anteater has evolved into a highly specialized creature by developing a long and narrow face to satisfy its taste limited to ants.

When people or animals rely on a single type of food or intellectual substance, they sometimes specialize to the extreme; in doing so, they prevent themselves from discovering new opportunities. In contrast, by feeding on a variety of scientific cultures, interdisciplinary researchers liberate themselves from the *path dependence* that is characteristic of disciplinary habituation. Based in institutional contexts propitious to interdisciplinarity, interdisciplinary researchers are able to submit concepts, theories, and disciplinary methods to a process of cognitive dehabituation, change point of view, and adapt to complex situations.

## Values

The recognition of complexity, cognitive diversity, and epistemological pluralism expresses the right to the co-existence of different forms of knowledge, not only disciplinary but also interdisciplinary and indisciplinary forms. In opposing attempts to impose the hegemony of one form of knowledge over another, it is important to defend the value of "cognitive justice" (Visvanathan, 1997) among seemingly incommensurable scientific cultures. This egalitarian treatment involves the establishment of dialogue and decompartmentalization of disciplinary knowledge for the development of a more equitable, sustainable, and democratic science. This message of tolerance among researchers with different disciplinary horizons rests on communication practices that are rooted in a capacity for empathy—not mere sympathy among researchers.

The adoption of a sympathetic approach involves feeling emotion about and interest in a different perspective while remaining within oneself and without changing one's ego-centred perspective. Thus the communication between disciplines is a simple reciprocal, face-to-face exchange and linear transmission of information from a multidisciplinary perspective. Reinforcing the encounter with the other disciplinary perspective with empathy (Berthoz & Jorland, 2005) consists in experiencing the emotion, interest, and point of view of several other researchers and putting oneself in the other's place. This process necessitates "mental rotation" as described by Berthoz and Jorland, a displacement/duplication or decentring of self towards the other in such away that one can see a problem from someone else's perspective and from a new angle. This capacity for empathy is one of the conditions for the successful shift from multidisciplinary communication (an exchange through the juxtaposition of points of view) to a dialogic interdisciplinarity that sets out to exceed and integrate knowledge. Cognitive justice, tolerance, and empathy are three values upon which an interdisicplinary work ethic must be founded.

## Creativity

By endorsing a complex idea and promoting the values of cognitive justice, tolerance, and empathy in the dialogue among disciplines, interdisciplinary researchers cannot be content with applying standard concepts and methods. On the contrary, they are encouraged to put creative abilities into action. This link between creativity and interdisciplinarity has already been illustrated (Darbellay et al., 2014), which focused on the case of serendipity as a creative process with a high scientific value. In this article, my co-authors and I demonstrated how the decompartmentalization of disciplines, the capacity for decentralization, and the spirit of openness to the unexpected are intrinsic components within work of researchers who

position themselves beyond and between disciplines. These researchers display a certain cognitive plasticity/flexibility that is considered as the ability to change their point of view, be tolerant of ambiguity, and make new connections between seemingly disparate ideas, concepts, or methods. Through combined processes of divergence (generation of non-conformist ideas, innovation, originality) and convergence (critical analysis, selection, integration), the creative researcher succeeds in developing intellectual products and/or practices that are both original and tailored to their context (Lubart, 2003).

The interdisciplinary process brings facts of "bissociation" (and its derivatives *trissociation* and *multissociation*) as described by Koestler (1964, 1978) into play. Thinking in terms of bissociation means making use of a cognitive ability (the Latin verb *cogitare* "to think" derives from *coagitare* "shake together and mix"), consisting of shaking up seemingly incompatible disciplines that initially clash and separate but eventually link up, combine, and reformulate. This process for the generation of new and interdisciplinary knowledge is particularly visible in the mechanisms deployed for the borrowing and transfer of concepts, theories, and methods from one discipline to another (Darbellay, 2012). These are "fortuitous contaminations" as demonstrated, for example, by Dumas (1999) in his study of the productive overlaps among Freudian psychoanalysis, physiology, and thermodynamics and those among molecular biology, anatomy and physiology. These "conceptual migrations" (Fedi, 2002) of *travelling concepts* (Bal, 2002) are powerful operators of creativity between and beyond disciplinary space and time.

The strategies for borrowing, transfer, and nomadisms are implemented concretely using analogies and metaphors between ideas, concepts, and theories belonging to different disciplinary fields. The analogical process in the sciences is justly contested by scientific orthodoxy when it is reduced to extraordinary comparisons or simple plays on words that claim to take the place of demonstration (De Coster, 1978). However, the analogical process emerges as heuristically productive if it enables the extrication of similarities of relations and resemblances without claiming identity or equivalence between the compared terms, fields, or disciplines. This heuristic potential of metaphorical language is explained perfectly in Ambrose's contribution and merits the sustained attention of all those interested in the conception of interdisciplinarity as a creative processes.

With reference to La Fontaine's fable *The Grasshopper and the Ant* (Delessert & Piguet, 1996), it could be said that the researcher-ant (who does not borrow any ideas, concepts, or methods) develops legitimate strategies for disciplinary conservation or conformism while the grasshopper-researcher develops his ability to borrow and transgress the boundaries between disciplines at his own cost and risk instead.

The ideal interdisciplinary researcher with high creative potential could be defined as the potential or realised combination of the ability to think in complex ways based on an ethic of interdisciplinarity and substantiated in creative acts of disciplinary decompartmentalization through borrowing, transfer, and productive metaphors of a new knowledge. The deployment of these linked abilities expresses the particular talent of all interdisciplinary researchers. Apart from personal aptitudes, the researcher is not born as interdisicplinary but can become so through the development of the above-presented abilities. The renewal of disciplinary or pluridisciplinary fields – such as the study of giftedness – should be able to rely on these types of researcher profiles, that already exist and have been discovered by some or for those who await education as a new generation of researchers that

complements the disciplinary researchers and contributes to the development of a new style of thinking (Darbellay, 2015).

## Conclusion

In order to enable researchers to exercise their interdisciplinary talent individually or as members of a group, it is essential to consider the possible obstacles and difficulties they may encounter. Naïve optimism has no place in this debate in that the epistemological and methodological obstacles are a reality experienced during attempts made at establishing dialogue between the disciplines. Each discipline has its own language, tools, and methods that create specific conditions for its further development and also represent pre-existing cognitive structures that must be negotiated in the interaction with other disciplines. The obstacles to interdisciplinary work also prove to be institutional in nature when researchers who attempt to go beyond disciplinary limits are confronted with a university system that promotes disciplinary careers and models evaluation and promotion procedures on the basis of an institutional organization consisting of faculties, departments, disciplines, and sub-disciplines.

It is also necessary to take into account the power relations and disciplinary egos that aim to maintain the academic territories in relationships characterized by incommunicability. This blindness vis-à-vis the disciplinary other prevent us from discovering new research horizons and seeing the "gorilla" emerging as a new idea in our cognitive field that we do not manage to see. Or as specialist researchers with narrowing fields of study, we resemble other metaphorical figures facing extinction like the panda, koala, grasshopper, and ant. In the competitive relations between specialists, the progress achieved by a group is sometimes accomplished at the expense of the others, and they eliminate each other in the manner of the grasshopper who eats the ant. It is precisely in the unplanned relations created at the interface between specialisms that innovation is born. Mauss (1980/1934) explained this potential very well:

> Now the unknown is found at the frontiers of the sciences, where the professors are at each other's throats, as Goethe puts it (though Goethe was not so polite). It is generally in these ill-demarcated domains that the urgent problems lie. Moreover, these uncleared lands are marked. … This is where we have to penetrate. … first because we know that we are ignorant, and second because we have a lively sense of the quantity of the facts. (p. 364)

Knowing that we don't know and accepting the role of ignorance as a means of opening up the frontiers of disciplines and scientific progress are two attitudes characteristic of the epistemological vigilance that underpins the development of the *savoir-faire*, *savoir-être* and *savoir-devenir* (ie. knowledge of how to do, be and become) of researchers. It is also important to strengthen institutional support in this spirit and to value the profiles of researchers whose high interdisciplinary creative potential asks only that it be substantiated in action. It is also important to strengthen and promote pedagogical training and innovation for researchers motivated by interdisicplinary work by allowing them to develop their abilities in the areas of creativity, dialogue, and theoretical and methodological integration.

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## About the Author

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**Commentary (17):**

# Murdering the Innocents

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> "Everything that happens […] shows beyond mistake that you can't shut out the world; that you are in it, to be of it; that you get yourself into a false position the moment you try to sever yourself from it; that you must mingle with it, and make the best of it, and make the best of yourself into the bargain" Written to a friend by Charles Dickens, September 6, 1858[4]

For me, Don Ambrose's essay is as enjoyable to read as it is satisfying, challenging and thought-provoking. I feel very much in accord with the thrust of his theme, and by way of declaring my interest and justifying my enthusiasm, I admit to being a synthesizer by nature and, as such, I find interdisciplinarity a concept I can fully embrace, both personally and professionally. For as long as I can remember, as an educator and clinician working with young people of various ages and in differing settings, my educational and psychoeducational activities have often relied on a framework of interdisciplinary, multidisciplinary and/or transdisciplinary thought processes.

Ambrose (2014)[5] advocates "going beyond psychology and education" in order to "clarify and strengthen the conceptual foundations for gifted education." In my opinion, this is wise. In fact, I believe anyone involved with the population of highly able and creative young people, worldwide, has a mandate – perhaps unwritten - to escape the proverbial 'box.' Irrespective of whether he or she be a parent, classroom teacher, counselor, psychologist, researcher or someone in some other way connected with the population of highly and creative young people, *that* individual needs to adopt an open-minded attitude and readiness to learn from the insight and experience of others.

Being an inveterate random thinker, my mind followed a rich diversity of pathways as I considered how I might add, in any meaningful way, to the discussion. One interesting waystation was provided by the American Psychological Association Presidential Task Force on Psychology in Education (1997). The Task Force (APA, 1995) concluded that the practice of Educational Psychology should include the integration of 'research and practice in a variety of areas within and outside of psychology.' Realms of study include education, sociology, anthropology and philosophy as well as several different fields of psychology, e.g., clinical, developmental, experimental, social, organizational, community, and educational and school psychology.

The same Task Force (APA, 1995) offered practitioners a number of important principles to consider. They included the importance of integrating both conventional and

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[4] Diniejko. A. (Contrib. Ed., 2012). *Charles Dickens as Social Commentator and Critic*. English Literature and Culture, Warsaw University; Poland. Retrieved from: http://www.victorianweb.org/authors/dickens/diniejko.html, March, 2015

[5] Ambrose, D. (2015). Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundations for Gifted Education. *International Journal for Talent Development and Creativity* (Special Issue), *3*(2), 33-58.

scientific wisdom, positive mental health and the systems necessary to serve children and teachers effectively. In Principle Two, for example, it is considered imperative that learners "negotiate understandings with others and internalize values and meanings within a discipline", "refine their conceptions by filling gaps, resolving inconsistencies, and revising prior conceptions." If children are to learn, Principle Eleven emphasizes the importance of their being given the "opportunity to interact and collaborate" and that there is an "understanding and valuing [of] cultural differences in the cultural contexts in which learners develop--including language, ethnicity, race, beliefs and socioeconomic status" and that this "enhances the possibilities for designing and implementing learning environments that are optimal for all learners." These thoughts led to me to Social Learning Theory and Vygotsky's work.

Although it is true the principles articulated by the APA Task Force [6]and tenets of Social Learning Theory[7] are particularly germane to the learning process in children, I consider their relevance ageless. In particular, I have found Vygotsky's notions of community discourse and the mutual appropriation of ideas especially helpful while teaching young adults at postsecondary level and when working with highly able and creative clients in a clinical setting. In the latter case, if individuals are encouraged to view their own energy, capacity to learn a personal experience and knowledge base no less important than mine, a deeper learning takes place and huge benefits are realized in terms of self-concept, self-efficacy and task commitment. Fullan and Langworthy (2014)[8] wrote:

> How leaders approach, engage and partner in professional learning is critical. In the cases of effective professional learning that we have seen, leaders truly do partner in the learning – with teachers, students, peer leaders and the broader stakeholder community. And they foster particular kinds of professional learning, most often involving … collaborative, social learning. (p.58)

This touches on the concept of professional capital[9], i.e., the result of combining personal competencies and skills, interpersonal relations and valid decision making. I envision realization of great benefits when leaders in our field share their professional capital as members of a wider, more diverse community of learners. I believe the following extract lends significant support to this notion:

> Through interactions with others, learners increase their awareness and understanding of these phenomena and the value of multiple perspectives. Increased understandings allow greater choice in what one believes and more control over the degree to which one's beliefs influence one's actions and enable one to see and take into account others' points of view. (Principle Twelve American Psychological Association Presidential Task Force on Psychology in Education (1995) [10]

[6] Fullan, M., Langworthy, M (2014). *A rich seam: How new pedagogies find deep learning*. Retrieved from: http://www.michaelfullan.ca/wp-content/uploads/2014/01/3897.Rich_Seam_web.pdf March, 2015

[7] For example see: Vygotsky, L.S. (1978). *Mind in Society*. Cambridge, MA: Harvard University Press.

[8] Fullan, M., Langworthy, M (2014). *A rich seam: How new pedagogies find deep learning*. Retrieved from: http://www.michaelfullan.ca/wp-content/uploads/2014/01/3897.Rich_Seam_web.pdf March, 2015

[9] Hargreaves, A., & Fullan, M. (2012). *Professional capital: Transforming teaching in every school*. London, UK & New York, NY: Routledge.

[10] American Psychology Association (1995). Learner –centered psychological principles: A framework for school reform and redesign. Retrieved from: http://www.apa.org/ed/governance/bea/learner-centered.pdf March 2015

## An analogy

As I further reflected on the essay, Charles Dickens and his novel *Hard Times* (1854) came to mind. Andrews (2012)[11] discusses how Dickens contributed to 19th century social reform, how his "timeless fictional narratives … continue to have relevance for contemporary social justice advocacy. Diniejko (n.d.)[12], [13] commented on Dickens' "strong social conscience" and how he, along with other leading social commentators, used fiction effectively to criticize economic, social, and moral abuses in the Victorian era compassion and empathy towards the vulnerable and disadvantaged segments of English society, and contributed to several important social reforms.

Dickens was a dystopian protagonist. He was sensitive to a state of entrapment experienced by elements of society, he questioned existing social and political systems, he believed something was seriously wrong with the society in which he lived and by means of his art he helped his nineteenth century readers, first in Britain and then elsewhere in the world, to understand the issues and recognize the need for change.

The absolute degree to which Dickens can be described as dystopian may be a matter of debate. Whatever the case, by way of his literary prowess he certainly created powerful images of an unpleasant, uncompromising and oppressive world controlled by individuals thoroughly convinced of their philosophical and moral rectitude and the legitimacy of their behavior. As noted, *Hard Times*[14] and especially a deeply revealing discourse embedded in chapters One and Two came to mind in the context of this discussion and so, in deference to the notion of interdisciplinarity, an analogy from literature courtesy of Mr. Dickens!

> NOW, what I want is, Facts. Teach these boys and girls nothing but Facts. Facts alone are wanted in life. Plant nothing else, and root out everything else. You can only form the minds of reasoning animals upon Facts: nothing else will ever be of any service to them. This is the principle on which I bring up my own children, and this is the principle on which I bring up these children. Stick to Facts, sir! In this life, we want nothing but Facts, sir; nothing but Facts! (p.8)

Thus enunciated Thomas Gradgrind, Charles Dicken's hardnosed, dogmatic and mechanistic character. Dickens went on to describe this man.

> A man of realities. A man of facts and calculations. A man who proceeds upon the principle that two and two are four, and nothing over, and who is not to be talked into allowing for anything over … of human nature, a mere question of figures, a case of simple arithmetic. He seemed … charged with a grim mechanical substitute for the tender young imaginations that were to be stormed away. (P.8 -9)

If readers have not had the pleasure of exploring the philosophy and not-so-subtle social critique of Charles Dickens, the following diatribe is an interesting entré to his work. Although fictional, like much of Dickens' writing, it reflects prevailing realities of his time and culture. It is incisive, instructive and – in my opinion - remarkably prescient of a 21st century dichotomy presented by Don Ambrose.

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[11] Andrews, A.B. (2012). Charles Dickens, Social Worker in His Time. *Social Work, 57* (4): 297-307.

[12] Diniejko. A. (Contrib. Ed., 2012). *Charles Dickens as Social Commentator and Critic.* English Literature and Culture, Warsaw University; Poland. Retrieved from: http://www.victorianweb.org/authors/dickens/diniejko.html, March, 2015

[13] ERICAE. Net, Clearing House on Assessment (n.d) *Charles Dickens*. Retrieved from http://ericae.net/influence-charles-dickens-literature-education.html, March 2015

Also: Brigham Young University (n.d): *Literary Worlds: Illumination of the Mind: Charles Dickens.* Retrieved from: http://exhibits.lib.byu.edu/literaryworlds//dickens/, March 2015

[14] Dickens, C.H. (1905). *Hard Times*. London, UK: Thomas Nelson and Son

> 'Girl number twenty,' said Mr. Gradgrind, squarely pointing with his square forefinger, 'I don't know that girl. Who is that girl?'
> 'Sissy Jupe, sir,' explained number twenty, blushing, standing up, and curtseying.
> 'What is your father?'
> …
> 'He belongs to the horse-riding, if you please, sir.'
> Mr. Gradgrind frowned, and waved off the objectionable calling with his hand.
> 'We don't want to know anything about that, here. You mustn't tell us about that, here. Your father breaks horses, don't he?'
> …
> 'Very well, then. He is a veterinary surgeon, a farrier, and horse breaker. Give me your definition of a horse.' (Sissy Jupe thrown into the greatest alarm by this demand.)
> 'Girl number twenty unable to define a horse!' said Mr. Gradgrind, for the general behoof of all the little pitchers. 'Girl number twenty possessed of no facts, in reference to one of the commonest of animals! Some boy's definition of a horse. Bitzer, yours.'
> …
> 'Quadruped. Graminivorous. Forty teeth, namely twenty-four grinders, four eye-teeth, and twelve incisive. Sheds coat in the spring; in marshy countries, sheds hoofs, too. Hoofs hard, but requiring to be shod with iron. Age known by marks in mouth.' Thus (and much more) Bitzer.
> 'Now girl number twenty,' said Mr. Gradgrind. 'You know what a horse is.' (p.9 – 10)

Some might smile when reading this extract. I have shared it a number of times with students in my educational psychology courses. Each time I have done so, many have expressed their reaction with a knowing smile, even – on occasions - a full-throated laugh. It is also true to say that some – often the note takers - have shown little or no reaction - the significance of the story, apparently, quite lost on them. *And* puzzled faces suggested an inability to understand why their education professor would even bother to read a story written by some ancient English guy when there was a perfectly sound, $120, modern, 21st century, scientifically-based text book to inwardly digest in readiness for finals at the end of term.

In truth, we probably can't begin to compare the majority of present day societies to disturbingly not-so-imaginary dystopian 21st century outliers brought unrelentingly to our attention via the global media, or to societies that now only inhabit the pages of history. However, where and when such societies have prevailed or do still prevail, criticism of the establishment is squashed; citizens are expected to conform; information, independent thought and freedom is restricted.

But to continue. As opposed to the description of a *horse* demanded by our pedant, i.e., Gradgrind, imagine it is the description of a *gifted child* he demands.

> 'Some boy's definition of a gifted child. Bitzer, yours.'
> 'Bipedal. Mostly omnivorous. Some vegetarian. Thirty-two teeth- three kinds. Found worldwide. Adds or sheds clothes according to climate, culture and/or activity. Depending on climate and local geography, for getting around will require anything from no shoes to heavy furry boots. Shiny SUV preferred. Age and intelligence determined by height, girth, color of hair, color of skin and facial features, country of origin, social economic status, use of vocabulary and an IQ of >130.
> Thus said Bitzer (and much more)"Now dear reader, you know what a gifted child is!"

Humor aside, it does seem rather ridiculous to capture the essence of such a diverse and beautiful entity – horse or gifted child - in such confined terms. Ever since being introduced to the work of Dickens -- his dark but richly descriptive portrait of McChoakumchild's dour Victorian classroom, Gradgrind's wretched lesson and his potentially destructive treatment of Sissy – *I* have been in the corner of *girl number twenty*! We might allow ourselves a moment to imagine how an individual, referred to only as a number, might define a *gifted child* based on vastly different perceptions of life and learning. It surely would have been as discrepant as 'chalk and cheese' from that offered by a boy named Bitzer.

Any expertise I might presently possess in psychoeducational matters has been largely gained by way of working more than forty years in a wide variety of establishments either in the United States or the United Kingdom. It has been my privilege to serve in various capacities, including as a regular and special education teacher, an art educator and education professor, and more recently, as an educational consultant working in a clinical setting. Having spent more than half of those years working with many highly able and creative children, their parents and educators, I have to report close encounters with ghosts of that fictitious Victorian classroom. Even though it is almost 150 years after Dickens' demise, doppelgangers - the Bitzers, Gradgrinds, McChoakumchilds - are alive, well *and* roaming free in school corridors and classrooms worldwide.

While wondering why this is the case, the character described by Dickens (1905, p.13) as one of *'some one hundred and forty lately turned at the same time, in the same factory, on the same principles*" – Mr. M'Choakumchild - came to mind. I was reminded of postsecondary education establishments with which I am familiar. Having been a faculty member of such institutions, I know full well teacher educators are genuinely dedicated to the task of 'turning out' *excellent* teachers. Despite this being the case, it is conspicuously evident that there is an attitude and general approach towards the preparation of teachers for professional service in public schools in the U.S. that reflects Dickens' observation – *same factory… same principles.*

In my opinion, based on the experience working with many would-be educators, probationary teachers are 'turned out' with inadequate and incomplete training, e.g., in the context of this discussion, little or no preparation for teaching highly able or creative children. During teaching practice and when eventually hired, they meet with strong resistance to individuality, resentment of criticism of the establishment, fear of thinking independently, tight control and a demand to 'toe the line'. Such attitudes not only mold their view of themselves, but also what is expected of them as they honor their professional responsibilities and their response to students who do not conform to *whatever* might be consider the 'norm.'

I have long been respectful of William Glasser's work in relational psychology[15]. In my teaching and work with parents, I often refer to his description of, what he termed, "the seven caring habits" in the context of teaching children who do not fit the 'norm.' I might inquire whether or not those responsible for providing a trusting learning environment are respectful, supportive, encouraging, prepared to listen, accept and negotiate differences. In

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[15] Examples:

a) Glasser, W. (2008). *For parents and teenagers: Dissolving the barrier between you and your teen*. New York: HarperCollins

b) Glasser. W. (1998). *Choice theory: A new psychology of personal freedom.* New York: HarperCollins

the same context, I like to refer to clinical psychologist, Kramer and her wisdom studies (1990). In her chapter (in Sternberg, 1990)[16] entitled, "Conceptualizing wisdom: the primacy of affect-cognition relations*"* she describes five 'wisdom-related processes' she considers essential. They are: recognition of individuality, recognition of context, an ability to interact effectively, develop an understanding of growth and change and pay attention to affect and cognition. Both Glasser and Kramer advocate a quite different attitude of mind to that of Gradgrind.

At this juncture I would ask readers to understand that I know not *all* gifted children meet with the same attitude as described below, but consider the following real life scenario. I am in a school office discussing the social emotional and educational needs of a recently evaluated child with the superintendent of the school system. He is a man of some high repute, responsible for the educational progress of approximately 1200 young people k-12 and creator of a mission statement that declared: *The mission of this community is to maximize each student's learning*. I thought it rather ironic when at one point in our discussion he barked out at me (in much the same way as Gradgrind may have barked out at Sissy or anyone who might hesitate to agree with him) words that remain clear in my memory, *"We don't have any specially gifted children in this school. All our children are gifted! Everyone is treated the same!"* [17]

In my experience, by default, gifted and creative children *rarely* conform to any norm. They have their own 'normality.' For example, this 3rd grader is almost four standard deviations above average – quite *normal* from my perspective, but distinctly *abnormal* according to his class teacher. Investigating the problem, I had found him totally bored and unchallenged in a classroom where every child is treated the same (except those on an IEP), where he is expected to read the same 3rd grade book despite an ability to read well beyond 8th grade level, where he is openly resented by his teacher and teased by many of his peers for 'knowing stuff.' He admitted feeling utterly alone and unwanted and his mother spoke anxiously about his increasingly explosive behavior at home. When faced with this situation it is hard to maintain one's equilibrium of mind … it is potentially serious.[18]

Advocating for this child presented an enormous challenge, not only to me but also for his parents. This 3rd grader, having to *survive* in this school system, and his parents who were trying very hard to do their best for their son, had encountered a worse case scenario –

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[16] Kramer, D.A. (1990). Conceptualizing wisdom: the primacy of affect-cognition relations. In R. Sternberg (Ed.), *Wisdom: Its nature, origins and development* (pp. 279- 309). Cambridge: Cambridge University Press.

[17] Robinson, K. (2006). *How schools kill creativity*. Retrieved from: http://www.ted.com/talks/ken_robinson_says_schools_kill_creativity?language=en, March 2015.

*Some readers may have seen the animated TEDTalk commentaries by Sir Ken Robinson on education, creativity and pressure to conform.[17] All his talks are very serious in terms of substance and message in addition to being thoroughly entertaining. Perhaps we may consider Robinson a 21st century Dickens! The message, after all, is very much the same and both he and Dickens are choosing to communicate, educate and engage minds and imagination by way of the arts.*

[18] Tebbs, J. T. (2011). Challenge deficiency disorder. Retrieved from: http://www.dghk.de/labyrinth-mitgliederzeitschrift/archiv/labyrinth-107-heft-1-2011/at_download/file March 2015

Tebbs T.J. (2013). How many canaries? Retrieved from: http://ablechild.org/wp-content/uploads/2013/10/CAnaries.pdf March, 2015

what I refer to as a toxic *learning* environment. Sadly, I found no evidence of Glasser's seven caring habits. Administration was far from encouraging - quite unprepared to listen or be supportive. Neither the parents' concerns nor my experience seemed relevant. *And* having no respect for the very evident differences between this child and his peers, he made it clear nothing would be changed on his watch. Given Kramer's perspective on wisdom, this leader in education was severely lacking. He was unwilling to recognize individuality, he expected nothing different to that expected of all his charges and he cared little about the intimate relationship between thinking, feeling and motivation.

It really doesn't matter from which realm of study we might draw lessons - a toxic environment is a toxic environment. A recent study in Lake Champlain emphasized concerns about the impact of phosphates entering the water by way of rainwater run-off from the farms and other dwellings along the lake edge. In summer levels of toxicity rise dramatically. Fish die, whole communities must endure the pervasive stench of putrefying blue-green algae throughout the summer, people get sick if they swim in the lake and more lowly life forms struggle to survive as the water's proper chemical balance becomes more and more comprised. Imagine the interdisciplinary spirit and drive necessary to address ecological health issues relating to one of biggest bodies of water in the United States.

Problems such as this, whether ecological or educational, will only be ameliorated when a need is recognized, evaluated and handled with a collective wisdom. In this sort of situation many disciplines need to interlink if a genuine desire for a solution exists. *But* … how different is this, in principle, when considering the accumulation of concerns faced by far too many gifted and talented young people around the globe? Of course, it is true that many do not face having to survive in a toxic environment, but I *know* many do.

The very same interdisciplinary spirit and drive is an imperative if the situation is to change. Certainly, I sense a *collective* wisdom is becoming more and more desirable within our field, because – and forgive me if this seems overly dramatic, speaking as a dystopian protagonist in the same vein as Charles Dickens, there are countless numbers of children and young people whose imaginations are 'stormed away' and the scene seems set for many innocents to be – metaphorically - murdered. I want to believe it is possible to bring about a change, but I suspect it will not happen if any of us remain, as I perceive it, insular, ensconced in our favorite ivory tower and inclined to preach to the choir.

Interdisciplinarity is not a one-way street. Those of us more fully informed about, and experienced working with, the gifted population, in whatever capacity, have as much to teach as we may have to learn from those operating both inside and outside our immediate world.

I recently read a statement entitled "The Steam-Roller of 'Competencies' in Education." It was published by *L'ecole democratique*[19] in the 21st century, 2011 to be exact. It was signed by a group of concerned educators from as far afield as Argentina, Belgium and Quebec. The statement opened with a description of their concerns:

> The economic, historical and cultural crisis which is now confronting our societies in different forms and modes is creating a menacing landscape around scholarly institutions and educational practices. A certain subjectivity and a politics of the immediate control and give shape to current pedagogical practices. (n.p.)

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[19] L'ecole Democratique (2011). *The steam roller of 'competences' in education*. Retrieved from: http://www.skolo.org/spip.php?article1297, March 2015

Although not dedicated to any distinct population of young people, I was particularly struck by the following paragraph especially as it deals with the very same issues highlighted by critics past and present. On the one hand, and especially pertinent in terms of negative calcified 'in the box' thinking, there are phrases such as, '*academic forms of the past'*, an educational policy '*decided in the abstract'* and '*a divisive and brutal logic.*' On the other hand, reference is made to the positive need for transmitting '*useful knowledge'* and '*efficacy in multiple senses, the sense of the past and of the world, of engagement in the construction of the future in society*.' Throughout the article there is implied a real and pressing need for the synthesis, metacognitive and extracognitive thinking in a wide range of settings and – I would say – a more conscious interdisciplinary approach to life, living and learning.

> To educate, we are convinced, means something else. It is not that we wish to cling to the academic forms of the past: schools must respond to the needs of the times. One of the challenges facing us is certainly to transmit knowledge and understanding which will be useful to the students, not in the sense of pure economic and individual efficacy, but efficacy in multiple senses, the sense of the past and of the world, of engagement in the construction of the future of society. But this challenge cannot be met by any policy decided in the abstract, still less by short term standards of economics and efficacy. We insist on the expertise as to the invention, daily and sustained, of our métier, teaching. And we demand that the institutions in which we work sustain the practices and the knowledge of the terrain which we have in order to permit teachers to actualize their power to act to succeed in the challenges presented by schools which they are best placed to understand, rather than responding to a divisive and brutal logic. (n.p)

I suspect we could expand on this statement by adding Don Ambrose's thoughts on what he might consider the 'brutal logic' mentioned above, i.e., 'excessively sanitized and oversimplified, highly mechanistic notions of human potential and behavior.' Do I hear Charles Dickens murmuring in his eternal sleep, "Mmm … indeed sir" or some other Victorian note of assent?

## Finally, back to Dickens

Undeniably, Bitzer's description of horse was, in many ways, accurate. However, the facts he probably learnt from a book provided by the school and regurgitated upon Gradgrind's command, could not convey all there is to know about the horse. Bitzer, for all his learning, was not able to provide the whole picture of the animal.

What Sissy Jupe had to offer we will never fully learn but can we safely assume it was no less accurate than the facts recited by Bitzer? After all she lived at the circus and most probably she knew more about the horse than Bitzer could ever begin to understand or explain. Sissy's learning was fully experiential. She knew the joys, feel, the sounds, smells, behaviors, capabilities, dangers, personalities, responsibilities entailed in birth, death, nutrition, health and welfare – in short, her knowledge of the horse was deeper, more meaningful, decidedly more insightful – in short, a rich and true expression of interdisciplinarity.

Although readers are informed "*girl number twenty*" is "*unable to define a horse*," Sissy exemplified an individual well able and willing to live – as Don Ambrose writes - on the edge of chaos, i.e., a state of affairs that could be described as complex and ambiguous! Apparently, for Sissy, neither circus life nor the school regime presented environments excessively disordered or chaotic. We learn that via her imagination, strength of character

and transforming spirit she established a fine balance in her life. She was able to go beyond Gradgrind's myopia and create a learning environment providing richer fare than the cold hard facts embraced by him and his kind. Not only do we learn this of Sissy, we also know she contributed to the lives of others, including the wife of Thomas Gradgrind, in positive ways. Her life experience and ongoing challenge, as complex as it was, contributed to her ability to handle complications and be recognized for her high levels of productivity.

Clearly both characterizations were – are - worthy of consideration. The problem to which Dickens drew our attention was Gradgrind's complete dismissal of the one in favor of the other. Sissy's insights were stifled by Gradgrind's overriding preference for the regurgitation of facts as the sole arbiter of intelligence and an appropriate education. In reality, 21st century Gradgrind and McChoakumchild 'look-alikes' are still around demanding facts to the exclusion of other important aspects of the individual. This is especially true with respect to what constitutes giftedness, in regular education and even in the field of gifted education itself.

## Interdisciplinarity and holistic assessment

Don Ambrose has very deftly presented the case for adopting a spirit of interdisciplinarity, a willingness to cross boundaries and metaphorically see what there is to see over the wall that might be of benefit to our field. I agree with his reasoning and conclusions. I have added my thoughts that essentially reveal my belief that interdisciplinarity is not unidirectional and that those outside our field have much to gain from this side of the boundary. Collaboration between experts from either side may lead to something new and mutually beneficial. In this context, I would briefly mention my own experience and present work.

As I perceive the issue, interdisciplinarity is another way of describing thinking, learning and acting *holistically*. I suggest Sissy Jupe was a holistic thinker. For her, a horse was a complex multidimensional combination of elements she knew to be true based on information absorbed day-by-day from the rich milieu of the circus. Had she been given time by Gradgrind to gather her wits, her explanation of a horse would, I am sure, have been multidimensional.

I am frequently asked to assess a young person suspected of high ability and later provide a 'description' of that individual to school personnel in the hopes of obtaining service for his or her exceptional needs. If I want this important endeavor to be successful, Bitzer's approach to thinking is not enough. Facts are important but only in the context of the many other aspects that constitute the whole entity – horse or child. As David Perkins (2010)[20] said, "**Without the whole picture there is no whole child.**" So while Sissy's more holistic view of the world is, in my view, better, a combination of the two approaches is better still.

With this in mind, I rely on a multidisciplinary, interdisciplinary and transdisciplinary approach to gathering a wide array of data which, when synthesized, assembled, and expressed visually, results in the creation of a powerfully comprehensive 'portrait' of the individual. Data and information is culled from multiple sources which typically fit into four

[20] Perkins, D. (2009). *Making learning whole*; *How seven principles of teaching can transform education*. San Francisco, CA: Jossey-Bass

categories, basically nature, nurture, behavior and ability. Experience working with parents, teachers and others interested in the individual's welfare has shown that when information from these sources is gathered and presented holistically as a 'portrait', then understanding is greatly enhanced (Tebbs, 2014a & 2014b).[21], [22] Experience with this approach has also shown that once a better, broader and deeper understanding is established there is a greater chance of critical thinking, positive decision making, action and all it may bring in terms of benefit to the individual.

## Concluding thoughts

Don has alluded to the benefits of interdisciplinarity at a macro-level. I have dwelt more on the advantages of interdisciplinarity at the micro-level. Either way his vision of innovation and problem-solving via cognitive diversity is inspirational. I agree that we must "*pay serious attention to what's in our own silos*" whether they are big institutional silos or smaller home town silos. Despite the unfortunate experience in the school superintendent's office, I believe unique opportunities do exist in our field[23]. As noted, since offering a more holistic perspective of individuals identified as having the potential for gifted and creative behaviors, I have begun to notice a reduction in dogmatism and an increased willingness to step over boundaries that would have previously impeded any form of progress. In fact, at the time of writing, after review of an array of holistic, visually presented information gathered by way of my psychological evaluations, six school administrators and their staff uncharacteristically supported immediate acceleration of twelve elementary children either by subject and/or by grade.

In my opinion, simply labelling a child 'gifted' and advocating for that child on the basis of a number, e.g., 130, will only exacerbate frustrations springing from the impasse so frequently experienced by *any* involved in our field – whether at micro- or macro-level. A transition is necessary and I do believe there is a way forward.

Thank you Don for stimulating our thoughts and capturing our imagination!

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[21] Tebbs, T.J. (2014a). Chandelierassessments.com. *Also see:* Tebbs, T.J. (2014b). Chandelier: Picturing Potential. *Roeper Review, Volume 36*, Issue 3, 2014

[21] See also: chandelierassessments.com

[21] Update and new opportunities: As of mid-December 2015 a new U.S. law – the 'Every Student Succeeds Act' (ESSA) – is gaining attention from those who have long recognized the need for proper support of 'advanced' students. It may be hoped that elements of ESSA may initiate a more realistic or holistic view of the student population K-12. However, a more lofty aspiration is that it may help establish a deeper understanding of why and how interdisciplinarity practiced on several levels, e.g., teacher preparation, school administration and classroom teaching, and move us beyond the homeostatic conditions so prevalent with respect to high ability children today.

## About the Author

**Dr. Trevor James Tebbs** has accumulated almost 50 years of experience as an educator on both sides of the Atlantic since receiving his initial training to teach children of all ages and special needs in U.K. When living in England he taught in several primary schools as well as serving as vice principal in a school for children with special needs. After settling in Vermont in the late 1980s he worked as a freelance artist, art teacher, and college art professor. However, during these years a deepening interest in the educational and social-emotional needs of highly able and creative young people led him to the University of Connecticut where he studied with Dr. Joseph Renzulli and his team at the National Research Center on Gifted and Talented Children. While there he received his doctorate in educational psychology with a focus on gifted and talented education.

Cutting a long story short, ultimately he built his own practice as an educational consultant based in Vermont. He now serves individuals of all ages from every state in New England and beyond. Typically, they present a wide array of complex academic and social emotional issues requiring comprehensive assessment and psychological evaluation. He encourages on-going support and a "systems" approach with individuals, parents, teachers and other school-associated agencies, e.g., school psychologists, counselors. These activities gave rise to a holistic methodology now supported by a computer-aided system called Chandelier. It is designed to collect, manage and communicate a wide array of rich data.

In addition to his clinical work Trevor has served as an assistant editor of the World Council for Gifted and Talented Children (WCGTC) journal Gifted and Talented International (GTI), adjunct professor teaching in the psychology department at his local university and enjoyed opportunities to travel, teach and learn from colleagues in Austria, Canada, Czech Republic, Denmark, Dubai, England, France, Germany, Greece, Poland, Switzerland, Turkey and Ukraine. He may be contacted via email: trevor@tebbspsychology.com

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**Commentary (18):**

# Toward a Sound Epistemology of Gifted Education

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**Keywords:** Dogmatism; reductionism; multiple-level developmental system; characteristic vs. maximal adaptation.

I applaud Ambrose's (this issue) call for borrowing insights from interdisciplinary work when tackling challenges in gifted education. A central theme emerging from the article is how to combat dogmatic insularity and avoid "the flight from reality." My commentary consists of two parts, one general and the other more specific. My general point is that dogmatic insularity has roots in human psychology as well as the logic of disciplinary inquiry. My specific point is that the tradition of scientific inquiry in gifted education, like in other areas, has a distinct reductionist bias. I use a framework, multi-level developmental system of talent development I have developed (Dai, 2010, 2014) to illustrate how these problems can be addressed in the field.

Dogmatic insularity is rooted in human nature. For both cognitive and motivational reasons (e.g., self-serving beliefs for ego or some ulterior interests, the human tendency to seek certainty and simplicity), we are prone to seeking cognitive closure, often prematurely (Kruglanski & Webster, 1996), and succumbing to confirmation bias that perpetuates our existing beliefs by selectively attending to and memorizing confirming evidence while ignoring or filtering out disconfirming ones (Baron, 2000). Just as everyday memory is characterized by various forms of commission and omission (Schacter, 2001), serious scholarship is not immune to premature cognitive closure and confirmation bias. Discrediting others' criticism as illegitimate or irrelevant is quite common in scholarly debates in psychology or elsewhere (see Kahneman, 2003). In addition, the nature of disciplinary inquiry also lends itself to strong adherence to certain ideas and beliefs. It is very likely that in "soft" sciences and ill-structured domains - such as psychology - in which particular knowledge claims cannot be completely falsified and multiple theoretical perspectives and related methodologies regularly co-exist. Once a theoretical or ontological commitment is made, or a research paradigm is adopted, it is hard to have a change of mind even though alternative perspectives or models are apparently plausible, viable, and even compelling.

Dogmatism is likely to happen when conditionality and complementarity of different theoretical perspectives give way to absolutism. Even in "hard sciences," paradigm wars are not unusual (Holton, 1981), let alone in education (Bredo, 2009). Taken together, it is likely that our enemy is from within rather than from without; that is, our theoretical lens and methodological canons are by nature exclusive, if not looked upon from a higher-level meta-perspective (Ambrose, VanTassel-Baska, Coleman, & Cross, 2010). As a quote often attributed to Einstein goes, "The significant problems we

face cannot be solved at the same level thinking we were at when we created them."

The second point I try to make is that the field of gifted studies, particularly how we conceptualize the elusive "gifted" quality, has a reductionist bias. Many symptoms Ambrose (this issue) identifies in many scientific fields, such as seeking mathematical and mechanical certainty or disciplinary envy, have to do with reductionism. For example, "physics envy" in social sciences is a distinct example. According to its most radical version, cellular-level phenomena can be reduced to molecular-level explanations in biology, and biology can be reduced to chemistry, and chemistry can be further reduced to physics, which, in turn, can be expressed mathematically, subject to falsification. The reductionist sentiment is best expressed by a neuroscientist who claims that, in the future, only neuroscientists are doing truly scientific work (e.g., finding the truth), and the rest of us (including all behavioral and social scientists) are merely "social workers" who act according to the uncovered secrets of brain work neuroscientists provide.

In the same vein, as a field, we tend to view high potential (or gifted potential) as "locked up" inside the person, only to be released by the stimulating environments. We see high IQs or similar psychometric measures as a good indicator of this quality, so that everyone's potential has a fixed point value. As such we don't view human potential as dynamic and growing in nature with the stimulations, tools, and support from the environment. Granted that natural endowment is an important piece of the entire puzzle; the developmental nature of human potential refutes a simple reductionist explanation. As Cacioppo (2002) put it, "a focus on elementary components contributes to an explanation only when considered in conjunction with events occurring at different levels of the system (p. 823). One solution, as suggested by Ambrose (this issue) is to treat developing human beings as multi-level systems, subject to different levels of analysis. In essence the notions of multi-level systems (ontology) and levels of analysis (epistemology) recognize the value and role of different worldviews (Pepper, 1942) or epistemic stances (Dennett, 1987) in understanding and explaining high human potential and high human accomplishments.

Consider the conception of giftedness in the field. Gagné (2005) identified giftedness as differentiated from systematically developed talent; that is, giftedness is natural endowment that is like raw materials used for talent development. This is what I view as a trait theory of giftedness. In contrast, Feldman (1986) portrayed child prodigies in art, science, and games as a result of the "confluence" of individual characteristics and environmental influences. His theory of giftedness can be described as "characteristic adaptations" that can be attributed to unique patterns of person-situation interactions. Convinced that any outstanding gifted accomplishment takes dedicated efforts, Gruber (1986) characterized the development of exceptional competence such as in the case Charles Darwin as "organization of purpose" and self-sustained construction of a unique view of realities. Different from the views mentioned previously, his theoretical perspective highlights the role of self and self-development. Each of the above theories carves the nature of giftedness in its own way, and indeed reveals one layer of the reality (at the proper joint). However, when insulated from others, each will be highlighted in analysis at the cost of others.

Over the years I have developed a four-level framework in an attempt to differentiate and integrate the four levels of analysis I introduce above (Dai, 2005, 2010, 2014). In this framework dubbed "giftedness in the making" (see Figure 1), aptitudes and dispositions (IQ, delay of gratification, intellectual risk taking, etc.) are trait-level descriptions, which are presumably

pervasive in functioning and amenable to psychometric assessment. "Characteristic adaptations" (persistent interests, patterns of strengths and weaknesses vis-à-vis a particularly task environment, etc.) are distinct patterns and regularities of person-context interactions, which may be built on personal traits but cannot be reduced traits given their context specificity. Construction of self/future is a more intentional-level explanation of how someone like Darwin achieved his greatness. Again, this intentional effort may be partly explained as "characteristic adaptations" yet cannot be "explained away," as it is likely socially and culturally mediated in specific contexts (e.g., his unique upbringing, the 19th century zeitgeist conducive to scientific exploration and discovery), and once developed, carries its own momentum and dynamics (e.g., a personal striving like Darwin's). As suggested by the Figure, the relationships between levels of analysis suggest embeddedness and interconnectivity. Thus, human potential is not only defined in term of what the developing person is inclined to do and capable of doing given a situation (i.e., characteristic adaption), but how the culture, with its resources, tools, and support, exert influences on one's self and to a lesser degree their characteristic adaptions and traits, and consequently enhance one's chance of overcoming obstacles and further developing their competence (maximal adaptation). The arrows in the opposite directions indicates that the dynamics is bi-directional and reciprocal, rather than unidirectionally determined.

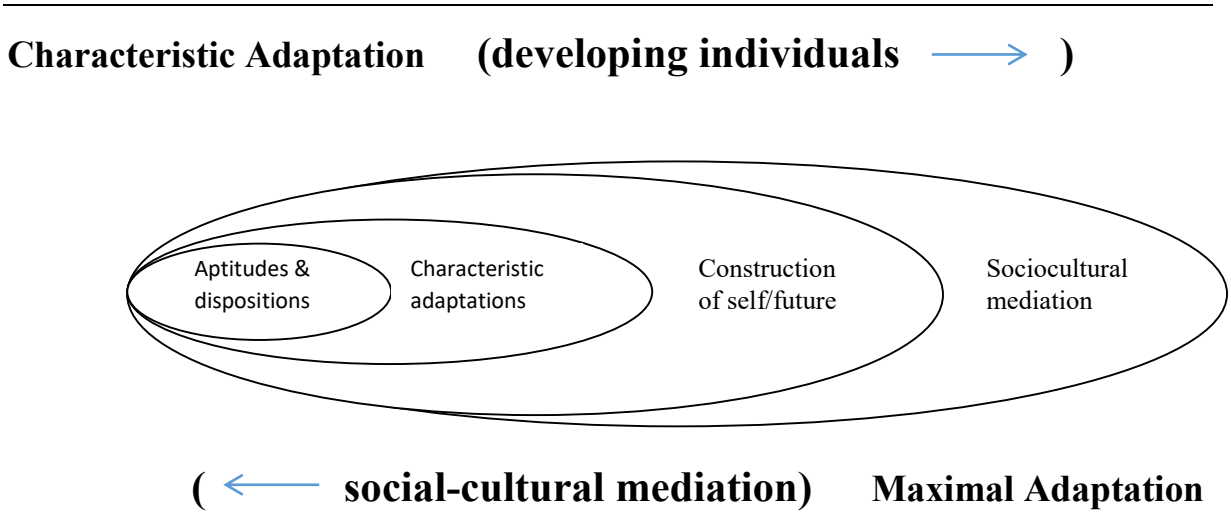


**Figure 1:** A schematic representation of "Giftedness in the Making" as a multi-level dynamic, developmental system

The multi-level system described above helps us avoid dogmatic insularity, as it acknowledges the role of both biology and culture and in the meantime, pays special attention to developmental changes in personal agency: from more spontaneous actions early on (characteristic adaptations) to more deliberate ones (maximal adaptations). It helps resolve the nature-nurture debate regarding exceptional human competence (Dai & Coleman, 2005; Ericsson, Nandagopal, & Roring, 2007; Gagné, 2009). It avoids the pitfall of treating humans as "meat machines," a radical reductionism, while not falling into the quagmire of mind-body dualism. Specific to gifted education, the multi-level systems approach avoids the reification of giftedness as an essence, holding its identity, unity, and continuity over time, while paying due attention to the significant role of biological differences in shaping one's life trajectories and pathways.

The multi-level dynamic system of the development of human potential described here represents a new epistemology of gifted education, as it seeks a non-reductionist, interdisciplinary synthesis of knowledge that can help enhance the optimal development of gifts and talents in children, adolescents, and adults. It has implications for how we identify gifted children: by traits or characteristic adaptations, and more importantly, how we rethink the role of culture, with its resources and tools, values and support, and the role of self-development, in making maximal adaptations.

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**Commentary (19):**

# How to Make Gifted Education Creative

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After reading numerous texts dedicated to the education of the gifted (which mostly referred to the definition of giftedness, identifying gifted students, the development of gifted programmes, the implementation of such programs and the evaluation of their effects), I came across a paper which attempts to offer a comprehensive analysis in this field and establishes that gifted education needs to strengthen conceptual foundations. I agree with D. Ambrose and congratulate him on his courage to risk linking what is unrelated in order to introduce innovation and create a new order in this field. To what extent the given proposals relate only to gifted education, or whether their implementation could be wider and refer to education in general, we will discuss later. In any case we were given a reasoned and well-argued text in which the author skilfully draws conclusions and forms questions which are relevant to the subject on the basis of the analysis of achievements from various sciences.

It seems to me that with his article "Borrowing insights from other disciplines to strengthen the conceptual foundations for gifted education", D. Ambrose tried to make gifted education creative. His suggestions about the ways in which "scholars can shed new light on high ability" could be commented on in the light of the explanatory power of the chosen approach. His proposal for interdisciplinary inquiry shows us that the phenomenon of gifted education is not yet sufficiently based on the basic resources which various sciences offer in the current phase of its development. What could the influence on gifted education be if there was a better understanding of the phenomenon which is expected from integrated study? It is unlikely that cultural differences could be eliminated in this process.

On the other side, if research and its results are freed from significant characteristics of context, by being placed on a higher and more general level, the question is raised as to what extent such findings would be usable?

Firstly, we need the establishment of an interdisciplinary perspective towards the topic of gifted education.

Comment could start from the gifted education phenomenon which is linked to high ability. One direction in the expansion of the approach to giftedness and creativity might be intercultural, from academic practice to the educational goals and philosophy of education. What is current today in the education of those with high abilities, those with promise, those who want to be highly educated, those whose goal is to become leaders, those who are the most needed in their local environment, and those who can and will be supported by their environments, from education to employment in appropriate jobs and positions? On the level of the state and the educational and school regulative, as well as in those sciences which deal with the education of the gifted, the question is posed differently: how should we support the giftedness, talents and creativity of all students or each individual to develop and

express, to the optimal extent, what they are best at, where their strengths lie, and what they can contribute most to the progress of his surrounding and humanity.

The multidisciplinary approach to studying gifted education, which refers to the lowest level of integration, could be compared with multiculturalism in education (Джуришич-Боянович & Максич, 2007). Politicians have given up on social multiculturalism in Europe, admitting its failure, while this idea is still present in school curriculums. Is the destiny of multidisciplinary research, which the current scientific community is aware of, similar? What does the transdisciplinary approach and the highest level of integration offer us in terms of the further development of gifted education? Does advocacy of the transdisciplinary approach and the highest level of integration in the scientific interpretation of gifted education only follow other global processes, such as the creation and domination of transnational businesses and companies? Globalisation is perceived as an essential process which develops independently of the aspirations of individuals, social groups and nations. Is that the case? Are all kinds of talents such that gifted individuals behave like leaders and become leaders?

How can we "guide tomorrow's brightest minds toward productive aspirations"? The most important aspects of gifted education and creativity studies are related to the development of leadership talent and identity formation among the gifted. Whatever we do in school even if we do not have any educational philosophy in mind, even when we claim that we do not rely on any theory or philosophy of education, that standpoint presents a certain philosophy as well. Better quality studies, action research, case studies, or any other attempt at conceived engagement in gifted education and education in general which has its goals, has at its base certain assumptions about child development and capacities, ways of acting and the achievement of planned goals. The same applies to those who carry out research. I think that we must be satisfied with fragmented concepts of giftedness like the multidimensional concept of culture because of the present level of human knowledge. For naw!

D. Ambrose adheres to the position that the concepts and definitions of giftedness are essential as a methodological frame to confine the field which is being observed in order to gain meaningful and relevant data in the implemented research. However, that does not mean that the researched phenomenon and its relations can be reduced only to what the choice and decision of the researcher were, nor does it mean that 'random', accidental or any other insights the researcher came to, regardless of whether they are presented as claims (that something is) or negations (that something is not) are unimportant. The use of metaphor as an exploratory tool and thematic integrator for interdisciplinary work is the idea which I like most. It seems to me that this is the most promising way because it offers a bridge between what is known and what is not known as well as between those who do know something and those who do not. Great writers have convinced us of the power and strength of metaphor and scientists are yet to use it. The integrative approach includes the innovation which metaphor can bring.

I am familiar with the idea about the domination of the American perspective in gifted education in the world, or at least in the literature which is accessible in the English language. Why the gifted are educated pursuant to this model can easily be explained by the continuum of the USA's global influence, from the story of the American dream which every committed individual can achieve, to the fact about the American state as a policeman who shapes

the world according to his interests and controls it in the aim of protecting his interests. In order to exit from the magic circle of the true values of one side - regardless of how universal they are - we should observe the issue from various sides, and in this regard D. Ambrose is indeed right. Various points of view already exist. What is needed is readiness to take them into consideration. The results of international research present possible sources for various perspectives. For instance, on the basis of the World Values Study (WVS) a cultural map of the world was constructed in which many differences between certain states and entities become clearer (Inglehart, & Baker, 2000; Inglehart & Welzel, 2005).

Support for imagination in childhood could be considered not only as a desirable precondition for the development of creative orientation and creative behaviour in adulthood, but also as the driving force behind further social development. The analysis of the data on valuing child imagination collected in the World Values Survey showed that the wealthiest European societies and social groups tend to value child imagination more highly (Maksić & Pavlović, 2013).

The most important variables for the status of child imagination at the aggregate level were cultural-historical heritage and the influence of social patterns defined by the dominant religion. Data about valuing child imagination among the citizens of Serbia, France, Germany and Great Britain indicated a low level of support for imagination in comparison with other educational goals, but the social elites of those countries evaluated imagination significantly more than other categories of citizens. The social elite in Serbia had small chances of supporting child imagination and creativity, in contrast to the other three aforementioned countries, because it was not actively included in the political life nor was it of interest to politics (Maksić & Pavlović, 2009).

D. Ambrose stresses the importance of ethics in gifted education. Is high intelligence ethical or are such abilities beyond ethics, which the previous history of humankind has convinced us many times? Ethics is a matter of norms and personal development, and gifted education, just like any form of education, is only one of the factors which shape personal ethics. Is the subject of ethics in gifted education real on the global level because it occurs within the same culture in which a given leader – if that is his responsibility alone - can make an unethical choice, or vice versa? Can an ethical leader resist contextual evil which, as the result of a certain set of circumstances, occurs at a given moment? Is something evil from the point of view of one, both or several opposing sides? As an example we can cite the bombing of Serbia (1999) in the name of a higher cause: to prevent human catastrophe. Who was ethical, or whose leaders where ethical in this case? Between ethics and politics, it is well known who wins. How can politics become gifted and creative in achieving the progress of people and nations?

The position that there is a risk of the cognitive elite exerting influence on others on the basis of unearned merit deserves attention too. I am not sure whether it is possible to recognize such a situation when it occurs or just before it occurs, therefore something remedial or preventive could be undertaken. The only thing we can be sure of is that such things do happen. If the surrounding opposition is aware that weak minds have been put in positions of power, there is no force which could make that public (except perhaps the media) and change the situation (the idea of big brother, who sees, knows and can do everything is implied). The idea of big brother is exceptionally dangerous, even if he is the most clever and ethical of all people in the world! The problem of societies in transition is more severe, because their social elites are socially ineffective (Maksić & Pavlović, 2012). On the basis of the WVS findings it

was concluded that the social elite in transitional Serbia was not interested in those aspects of work which would facilitate leadership, self-actualisation and creativity which caused doubt regarding its authenticity and power to carry out its social role.

The most valuable part of D. Ambrose's paper are recommendations for the expansion and strengthening of interdisciplinary work in gifted education, not a very popular idea among scientists and researchers who are aware of the limitations of their work, and very necessary to the teachers and education practice to which it refers. Finding the right ratio in what is recommended represents the distinctive characteristic of creative individuals which is also recognised in the article. Not only could we "clarify and strengthen the conceptual foundations for gifted education by going beyond psychology and education to explore theory and research in other disciplines", but such a task is essential for the further development of this field. There are numerous anecdotes about how some elite and influential creators had bad experiences in school, and research shows that there are creative children among school underachievers and failures even from elementary school (Maksić, 2010).

In sum, it is obvious that educational support for the development of students' individual capacities, talents and creativity demands continuous changes in education around world. Does gifted education add up solely to the cognitive aspect if the significance of the complexity theory of intelligence is emphasised? Individual development and education are two general subjects with which social sciences deal; therefore gifted education has, by its nature, the need for an interdisciplinary approach. The use of complexity theory is a good idea, but one on a very conceptual level, while the use of cognitive science is already present in research into giftedness and gifted education. The advantages which are ascribed to interdisciplinary research could be linked to any problem in education and not only to gifted education.

The offered text which proposes a new approach to the problem of the conceptual foundations for gifted education could become a seminal paper, as was Sternberg's (1985) article about implicit theories of intelligence, creativity, and wisdom. We met many controversies in the interpretation of human capacities, with which the author deals in his work. I share D. Ambrose's belief that what is known about high ability in the frame of various scientific disciplines can be of use to researchers and theoreticians in the field of gifted education and creative studies. I would like to accentuate one more impression about the quality of the text and its messages to scientists and practitioners for insightful and meaningful collaboration on the issue. The article is written in fresh language which has a scientific base, but is also journalistically attractive. We can take it as the first step in fruitful interchange.

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**Commentary (20):**

# Response to Don Ambrose's Article

**Julia Link Roberts**
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**Keywords:** Synectics; collaboration; interdisciplinary.

Taking an interdisciplinary approach is usually preferable to addressing a problem or topic from one vantage point or single perspective. Dr. Ambrose presents a thesis that an interdisciplinary approach will augment understanding of giftedness and its conceptual foundation, and I certainly agree with that thesis.

The conceptual foundation for gifted education has a fairly short history though interest in the gifted individual has been long standing. Specialists focusing on gifted education primarily have been from the fields of psychology and education. Arts and sports specialists have added their perspectives in the study of talent development, and that perspective is becoming central to the understanding of children with gifts and talents. The depth of understanding will increase as gifted education is studied from multiple vantage points. Collaboration will augment understanding of the conceptual foundation of gifted education. Being open to new perspectives must be encouraged and appreciated.

William J. J. Gordon (1961) described Synectics as a method for creative problem solving. Participants in Synectics groups represented various content backgrounds and areas of expertise. Before the solution can be reached, the various perspectives meld. The purpose was to integrate into a Synectics group people of opposing personality and differing academic background. The most elegant solution to a given problem is one where the solution is the simplest in proportion to the complexity of the variables involved. (p. 12)

Such an interdisciplinary approach will continue to expand thinking about a conceptual foundation in gifted education.

One of the challenges in a field is to establish a conceptual foundation and to remain open to expanding that understanding. In gifted education, one problem has been to agree upon who is gifted. In addition, the question arises as to what is talent, and how do talent and giftedness differ and what do they have in common? The current interest in innovation highlights the importance of creative thinking. Creativity is very important, and it adds another dimension to expand the conceptual foundation of gifted education. Furthermore, does the field of gifted education focus on potential giftedness as well as giftedness?

Likely, the conceptual foundation for any field will continue to evolve, and that is certainly the case with gifted education. It is important to look at a topic from new perspectives and doing so is a challenge for the expert, the one who is steeped in that particular area of expertise. Gordon stated, "When it comes to the advancement of knowledge, even within his special field, the expert is often the man least able to create a new idea, unless he is capable of suspending his expert's abstract attitude toward the subject (pp. 99-100)." Specialists in gifted education must remain open to ideas that could shape our

understanding of giftedness and talent and be willing to collaborate with others in order to enhance understanding of the field.

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**Commentary (21):**

# Let's Talk: Opening the Way to Interdisciplinary Exploration of Giftedness

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**Keywords:** Boundaries; collaboration; gifted; interdisciplinary, academic handcuffs.

This commentary addresses Don Ambrose's targeted article from the point of view of a practitioner turned researcher in the field of gifted education. The current situation of existing power structures is examined and it is suggested that, as the status quo is not resulting in substantial benefits for gifted students in schools, then perhaps it is time to challenge the narrowism of current thinking.

## Boundaries

> There are more things in heaven and earth, Horatio,
> Than are dreamt of in your philosophy. (*Hamlet,* 1.5.167-8)

Horatio was as educated as Hamlet, yet his friend urged him to be open to intellectually explore the boundaries of the known. These lines, written by Shakespeare over 400 years ago, seem as relevant today.

In his article, Don Ambrose asked that we explore collaborative interdisciplinary opportunities in gifted education, looking for "strengths, flaws, and refinements." My question would be why has it taken us this long? When carrying out research, we tend to 'zoom in' on an issue and drill down to the heart of the matter. In order to see the context on this occasion, I would like to begin by 'zooming out'.

Since I entered academia ten years ago, boundaries seem to have loomed large. The adversarial nature of research has surprised me. Many researchers in the field of gifted appear to be at odds with each other because of differing viewpoints. Ontology and epistemology determine their own 'truths', as though an alternative approach might produce 'untruths'. Pring (2004) referred to the 'false dualism' of educational research; observing that when researchers work within different paradigms, the results can be dismissed by some as 'epistemologically flawed' (p. 44). For every winner, there is a loser, it seems. Popper (1972) stated that epistemology may be approached from two sides: he described 'common-sense knowledge' and 'scientific knowledge'. He saw the second as being an extension of the first. Instead of accessing the knowledge of the published literature, McBee (2004) suggested teachers sought advice from within the profession:

> When faced with the task of making decisions in the classroom, teachers rarely turn to research. Instead they rely on intuition or take advice from colleagues... the exclusion of teachers' voices from research literature, educational policy decisions and curriculum decisions, may lead teachers to distrust 'outsiders' (p. 53).

That is the crux of the argument in support of the need to widen our understandings and open up the field to new dimensions of thinking. We need to open up the boundaries. The current ways are not working. In gifted education, teachers are not accessing the literature. As McBee (2004) claimed: "Research results often do not make it to the classroom where they can improve practice" (p. 52). In many countries around the world, gifted education has stalled in the last ten years – and we have to ask why.

## An understanding of the term 'gifted'

As we researchers know, (but is a surprise to many practitioners), the term 'gifted' doesn't have an agreed definition in education. Carman (2013), claimed researchers in the field can therefore be comparing apples and oranges. There are those who claim that this lack of consensus doesn't matter, even though it has resulted in a Tower of Babel situation where misunderstandings abound (Gagne, 2004). If we cannot provide the language of common understandings, how can we explore scientific knowledge? A scientific discipline tests hypotheses. If, however, we cannot agree on what the words mean, is there any point in having a debate? It is at this first hurdle that practitioners often lose patience with academics. It is not surprising that identification, and therefore provision, of gifted is often put in the 'too hard' basket by schools.

## The individual, the environment and learning pathways

There has been some movement in recent years away from selection criteria that focus on the individual (Plucker, 2012). The ever-present accusation of elitism exists in countries that have the foundation of their education systems firmly set in egalitarian principles, for example, New Zealand, Australia, Japan and most European countries. Renzulli (2004) suggested that selection criteria to identify gifted students should be expanded from an over-reliance on cognitive tests. He named his research Operation Houndstooth and explained that the background of his 'houndstooth' was made up of the various components of personality and environment; his interest lay in how "more socially constructive giftedness" (p. 65) can be nurtured. Renzulli identified traits such as "optimism, courage, romance with a topic or discipline, sensitivity with human concerns, physical and mental energy and vision and a sense of destiny" (p. 65). He pondered on the question of what makes a Mother Teresa, Nelson Mandela or a Mahatma Ghandi?

> As we expand our conception of giftedness we will find that many people have been excluded from advanced opportunities because of language; socio-economic background; culture, gender and ethnic differences; stylistic differences; and other differences perhaps yet undiscovered, will be given greater opportunities to develop their potentials (p. 66).

Gagne (2009) has for decades emphasized the importance of the environment and the increasing role played by 'chance' in developing talents. Recently, Subotnik, Olszewski-Kubilius and Worrell, (2011) argued that giftedness in adulthood had to be linked to eminence, therefore having the potential was insufficient. Yeager and Dweck (2012) summed up the need to consider a modern view of giftedness as it is claimed that one reason gifted children may not become gifted adults is because they are not taught to learn from failure.

Many of our gifted young people need constant praise, become afraid of challenges and fall apart when things do not come easily to them. As a result, they lose their ability to grow. The most important task facing us today is how to develop and sustain talent by fostering a love of learning, a zest for challenge and resilience in the face of setbacks (Dweck, 2009, p. 316).

Learning pathways today need to consider issues like resilience and 'grit'; it is necessary, therefore, to consider other disciplines. Working across disciplines is necessary, for example biology or neuro-science, in order to seek new knowledge at the intersections. The reason given for such studies not being common is that it is very difficult to work across disciplines in ways that are seen as ontologically and epistemologically coherent.

Some issues have been well rehearsed in the literature – but remain unresolved. For example: Who are our gifted? What constitutes giftedness? What types of intelligences should we be measuring as having the most potential to benefit society as a whole? How can we ensure that identification methods are culturally sensitive? Why do boys outnumber girls by two to one in gifted programmes? Why is enrichment preferred over accelerative provisions when the evidence of the latter is unequivocal (VanTassel-Baska, 2015)? The more important issues are not definitional but the consequences of groups agreeing on their understandings of these issues (Cramond, 2004). Currently, we don't agree, hence the need to widen the discussion.

## Let's talk

Despite more than a decade of focus on gifted education, recent figures show a decline in performance in the top 10 per cent of students in Australia (Program for International Student Assessment (PISA) data (2003-2009). Although the figures are not quite so dramatic in New Zealand, the declining trend is the same. I repeat, what we are doing is not working. We need to re-visit how we are thinking and what we are doing, in gifted education. There are many children who have gifts and talents who are *not* being recognised and provided for in education systems around the world. We could blame Governments, schools and/or teachers – but isn't it about time that we looked at ourselves? The current narrowism is not working.

There is a certain lack of generosity of spirit in academia. If we stray into the domains of others in terms of publishing, it is made clear that gifted belongs 'elsewhere'. The welcome of 'hi stranger, pull up a chair'… is missing.

Now why is this? Have *we* always been welcoming to those from other disciplines? Is it possible that we have been too precious, too exclusionary? Perhaps it is time for us all to put aside egos and self-interest. Silo-thinking has been to the detriment of progress. The academic handcuffs that bind us to research and publish in accepted areas, have stifled any possibility of interdisciplinary collaborations. As a result, we have to admit that little new has emerged in terms of concepts, in the last 30 years. An interdisciplinary exploration would be a good start in uprooting the existing power structures to make way for something different. I applaud Don Ambrose for asking the questions and starting this discussion.

The late President John Kennedy (JFK) in his 1963 address to the Irish Parliament in Dublin, quoted George Bernard Shaw's, approach to life:
Other people see things and say: 'Why?'... But I dream things that never were - and I say: 'Why not?'" JFK continued:

> The problems of the world cannot possibly be solved by skeptics or cynics, whose horizons are limited by the obvious realities. We need men who can dream of things that never were, and ask why not.

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**Conclusion Paper:**

# A Dialogue with Adventurous, Interdisciplinary Explorers: Reactions to the Response Papers

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## Abstract

The respondents to this special issue on the interdisciplinary exploration of giftedness, talent development, and creativity generated a wide variety of thought-provoking ideas for the refinement of interdisciplinary work. This reaction paper represents an attempt to analyze and extend some of the respondent's recommendations. It also includes some new ideas inspired by the work of the respondents. Subtopics addressed include the dogmatism embedded in academic domains, reactions to criticisms of interdisciplinary work, expansion of our vision into more aspects of the socioeconomic and cultural environments that influence child and adolescent development, the abilities required for conceptual and practical interdisciplinary work, and new strategies for scaffolding the work of interdisciplinary teams in gifted education

Is exploring the potential benefits and occasional drawbacks of interdisciplinary work in gifted education worthwhile? Thanks to the respondents in this special issue for thinking it is. I have enormous respect for the contributors, some of whom are excellent interdisciplinary wanderers in their own right. Here are just a few examples. Roland Persson (2012, 2014, in press) has done much to reveal contextual influences on conceptions of giftedness by borrowing from multiple academic disciplines. David Yun Dai has extended our thinking beyond dominant paradigms and some of his work has relied on constructs from beyond our field (see Dai, 2005; Dai & Chen, 2013; Dai & Renzulli, 2008). Bharath Sriraman has carried out adventurous, interdisciplinary synthesizing in his important work on mathematics education and general education, and in his various editorial roles at the international level (e.g., Sriraman & Dahl, 2009).

Other respondents provided a variety of additional impressive interdisciplinary insights in this special issue. For example, Shelagh Gallagher established a very helpful, detailed analysis of some ways in which interdisciplinary work in gifted education can stumble or thrive depending on decisions we make about implementation details and processes. Especially helpful is her description of criteria that can be used to gauge the strength of the supports necessary for successful interdisciplinary work in gifted education. Peter Merrotsy engaged in some very broad interdisciplinary exploration of his own by bringing into play conceptions of consilence and C. P. Snow's two cultures (the split between the humanities and the natural sciences). The notion that the chasm separating some disciplines from others is a barrier to the solution of the world's largest problems resonates because it aligns with arguments made in large-scale, interdisciplinary analyses of 21st century globalization (see Ambrose and Sternberg, in press-a, in press-b).

Connie Phelps broadened our vision with descriptions of a charter of

transdisciplinarity and other international projects produced by interdisciplinary explorers who are attempting to integrate knowledge that currently is spread throughout far-flung fields. Phelps also promoted a less hierarchical conception of academic disciplines by giving the arts more attention and respect.

Rama Klavir helped us to think more about the barriers we face when we try to be interdisciplinary because those who have attempted such work in the past often have been considered amateurs or outsiders who might miss important details within specialists' silos. This is a valid concern, and a weakness of interdisciplinary work; however, it shouldn't dissuade us from navigating through the terrain of multiple disciplines to look for insights that might generate creative theory, research, and practical applications in gifted education. Klavir went on to provide a practical example of an interdisciplinary study that can help us design interdisciplinary explorations for professionals in gifted education and their students.

Narrowing the scope, Vlad Petre Glăveanu and Maciej Karwowski illustrated ways to integrate knowledge across conceptual borders even within disciplines. Arguing that psychology is a heterogeneous field, along the lines of the fragmented, porous, contested disciplines as portrayed by Bender and Schorske (1997), they advocated conceptual integration within disciplines as well as beyond. They also contended that interdisciplinary work can be facilitated when differing disciplinary perspectives come together through the lens of one key concept from each discipline. I certainly agree that key concepts can serve as thematic integrators for interdisciplinary teams as they did in some of my recent projects revolving around concepts such as dogmatism, ethics, the chaos-order continuum from complexity theory, and 21$^{st}$-century globalization.

## Framing interdisciplinary work

Some of the respondents came up with very good ways to strengthen interdisciplinary work, which is exceedingly difficult due to the large number of complex constructs unearthed during transdisciplinary excursions. Aligning somewhat with my recommendation to employ metaphor as a tool for transdisciplinary simplification and bridge building, Susen Smith and Chinhsieh Lu reminded us of the metaphor of a field delineated by a protective fence pegged out with the four stakes of genius, giftedness with intelligence, creativity, and wisdom. The metaphor is based on contributions from giants within and beyond the field such as Galton, Terman, Torrance, and Sternberg. As mentioned in my focus article, while metaphor can be confining, it also can generate creative thoughts about our field. For example, elaborating on this farmer's field metaphor we might extract insights from economics, sociology, and social epidemiology to help clarify whether or not the growth of some of the plants (children) in this field will be stunted by impoverished socioeconomic soil while other, rather ordinary seeds will grow into much larger plants than they otherwise would because they were planted in the richest economic topsoil possible. We also can ponder the possibilities of genetic engineering creating monocrops of children in the future, or small numbers of superior plants with artificially enhanced abilities that had the benefit of growing in exclusive plots saturated with extremely rich socioeconomic fertilizer.

I was also pleased to see the use of visual metaphor in the reversing underachievement modified prism graphic in the response article written by Ken McCluskey and Taisir Subhi Yamin. This visual metaphor derived from an original model developed by Baum, Renzulli, and Hebert (1995) has considerable impact on those who peruse its

dimensions. As McCluskey and Subhi Yamin suggested, “the words pale in the face of the visual metaphor” (p.10).

Frédéric Darbellay employed very interesting metaphors in his descriptions of the abilities required for successful interdisciplinary work. He portrayed the successful interdisciplinary scholar as a chameleon who can adapt to new environments by transforming itself to fit those environments. Meanwhile, the silo-bound specialist who ignores, rejects, or fears interdisciplinary work is more like a panda, koala, or anteater because the excessive specialization designed for adaptation to its specific environment limits its chances of survival in very different intellectual environments. While metaphor isn't the only tool for interdisciplinary work, it certainly is a useful one as evidenced by the examples provided by our insightful respondents.

## Criticisms of my interdisciplinary approach

After carrying out two large-scale projects on dogmatism (Ambrose & Sternberg, 2012; Ambrose, Sternberg, & Sriraman, 2012), I have a strong appreciation for the likelihood that some of the things I'm quite sure about are wrong or at least partially flawed, and my wrongheaded assumptions likely are implicit, hiding below my level of awareness. Bruce Shore helpfully raised some concerns about some of the points I made in the focus article. Here, I attempt to recognize the value in some of his criticisms while also attempting to challenge a few of them.

First, Bruce raised the issue about whether or not gifted education is an academic discipline. This was a good question to raise. After pondering it for a while, I suggest that it doesn’t really matter if we conceive of gifted education as a practical, professional field or as a discipline. I tend to agree with Bruce that it's more the former than the latter but that doesn't invalidate the need for borrowing from foreign disciplines.

Bruce also worried that I am wanting to push psychology and education off the table to explore theory and research in other disciplines. If my discussion in the focus article implied a rejection of research and theory in psychology and education, that was not my intent. My default position is to incorporate ideas from all relevant disciplines and this would keep psychology and education as the central players. We just need to go beyond them to incorporate more ideas from more disciplines because research and theory in psychology and education simply can't reach out far enough to capture all of the relevant phenomena pertaining to giftedness and talent development, especially phenomena having to do with socioeconomic, ideological-political, and cultural influences.

I more directly contest a few of Bruce’s points. For example, he claimed that I caricatured and oversimplified mathematics. In actuality, I cited a prominent mathematician (Byers, 2007, 2011) who critiqued the *sterile certainty* that often plagues his own discipline and the natural sciences. Another prominent mathematician and mathematics educator, as well as a contributor to this special issue, Bharath Sriraman, and his coauthor Matt Roscoe, provided some clarity about this mathematics issue by describing the front and back side of the enterprise of mathematics: On the front side, mathematics is presented in finished form as precise, clear, ordered and abstract… The backside is…fragmentary, informal, intuitive and tentative. Using the terminology of Sriraman and Roscoe, my contention is that the frontside of mathematics provides the sterile certainty that seduces those in our field who want to emulate the precision of the disciplines residing at the top of Simonton's (2004, 2009, 2012)

hierarchy of the sciences. In other words, mathematics isn't excessively simplistic but the ideas some educators, policymakers, and academics have about mathematics might derive from dogmatic assumptions about excessive precision, clarity, order, and abstraction.

Along similar lines, Bruce argued that my characterizations of excessive mechanistic empiricism and psychology craving recognition as a science were at least somewhat inaccurate. I agree that the most astute mathematicians and psychologists would not see it that way, but my claim is that the more pedestrian thinkers in mechanistic disciplines cannot so easily escape the methodological and epistemological frameworks wherein they reside. Other respondents in this issue seem to agree that research and theory in gifted education have been warped somewhat by excessive mechanistic reductionism. For examples, see the articles by Roland Persson and David Yun Dai. David elaborated on the problem of *physics envy* whereby the phenomena we attempt to clarify might be boiled down in a radical way to the cellular, molecular levels and beyond. Illustrating the value of interdisciplinary work even more, we can borrow an insight from the prominent neuroscientist Gerald Edelman (1995) who said that reductionism has value but pushing it too far leads to "silly reductionism." Edelman himself was a reductionist who lamented excessive enthusiasm for the investigative paradigm he used to guide his own work.

Bruce also wondered why I was reaching out for new jargon such as the *modularized microexpertise* described by physicist Eric Nielsen (2011) in his discussions of 21st-century networked science. My intent here was to show how fields often travel in parallel with one another without realizing it. So the parallels between modularized microexpertise and distributed cognition are illustrations of parallel intellectual paths. These can be informative, revealing opportunities for interdisciplinary collaboration on phenomena of common interest. For this reason I think we should embrace terminology from other disciplines even if we have our own names for the parallel phenomenon under study. Discovering these similarities can help build bridges between disciplines that share interests.

Finally, Bruce says that I omit some interesting disciplines such as psychobiology and medicine. I agree. I couldn't possibly explore every relevant discipline so I used some examples to make the case for more interdisciplinary work. I intentionally cast a broad net for these examples because, as Shelagh Gallagher pointed out in her response article, gifted education already has a multidisciplinary structure and "blurry boundaries" but it hasn't yet benefited from much in the way of substantial, interdisciplinary work. Far more disciplines are explored in some of my other interdisciplinary projects (for examples see Ambrose, 2009; Ambrose & Cross, 2009; Ambrose, Sriraman, & Pierce, 2014; Ambrose & Sternberg, 2012, in press-a, in press-b; Ambrose, Sternberg, & Sriraman 2012). I thank Bruce for raising these issues because it helps me understand where I actually do have some misconceptions, and where I need to clarify my positions a little more.

**Dogmatism in domains**

In this section I build on some of the points discussed in the foregoing overview of criticisms. As mentioned earlier it is difficult to escape our biases and habitual ways of thinking. All of us wear blinders of dogmatism at least some of the time. Fortunately, some of our respondents help with this additional exploration of implicit biases.

Some of our respondents have agreed that problems arise when scholars and practitioners focus too intently on the content and methodological procedures within the

dominant paradigmatic walls of their disciplines (see the papers by John P. Anchan and Frédéric Darbellay). These arguments about domain-specific narrowing seem to reinforce the concerns I raised in the focus article while also aligning with some recent discussions of the ways in which closed-minded entrenchment can result from perceptions of expertise (see Ottati, Price, Wilson, & Sumaktoyo, 2015). The story Anchan relayed about a government bureaucrat from a funding agency informing researchers that funding would be restricted to "true research involving numbers and statistical data" emphasizes at least this form of methodological dogmatism.

Darbellay highlighted problems that can arise when researchers' identities exert confining influences preventing them from perceiving the benefits that might be gained from crossing disciplinary borders. This seems like a form of identity dynamics along the lines of those studied by the prominent philosopher Alan Gewirth (1998) and leading political philosopher Kristen Renwick Monroe (1996, 2003, 2004). For example, Gewirth distinguished between particularist and universalist identity formation. Particularists relate very well to others who share their ethnic or cultural identity but ignore or even denigrate and abuse outsiders whose identities differ from their own. Meanwhile, universalists don't make such distinctions and value the worthiness of outsiders as well as those who share their identity markers. Applying this to Darbellay's discussion of disciplinary identity, we can conceive of those who reside firmly within their own domains as domain-specific particularists, especially if they ignore or denigrate interdisciplinary scholars whose epistemological and methodological "cultures" differ from their own penchants for hyper-specialization. Given the increasing importance of interdisciplinary scholarship and practice in 21st-century conditions that require more idea sharing and synthesizing (Ambrose, in press), the dynamics of identity formation in academia require more attention.

## Grinding ourselves up in our own useful, hyper-mechanistic gears

Several respondents took up the call for more methodological flexibility in our field. Michael Shaughnessy and Roland Persson highlighted the problem of narrow conceptions of research dominating the funding and regulations by foundations and governments. Persson talked about excessive attention to mechanistic measurement "with science quality controllers breathing down our necks." This is one helpful example of the way in which discipline envy based on Simonton's (2004, 2009, 2012) hierarchy of the sciences encourages excessive bean counting and gets in the way of insights that might come from syntheses of perspectives from multiple disciplines. Throughout his response Persson argued against the dominance of any particular methodology, especially excessive emphasis on mechanistic empiricism. His arguments align well with the portrayal of multiple scientific methods by a prominent physicist (Derry, 1999; discussed in the next section).

Persson also showed how Kolstoe (1979) proposed that the academic climate of a university should protect fragile, new ideas so they are not prematurely destroyed by criticism. This aligns well with the *grace period* the eminent philosopher of science Imre Lakatos (1978) proposed for new theories in academia. The grace period is required to prevent premature rejection of potentially useful new ideas. This kind of thinking is particularly important when we borrow ideas from foreign disciplines because those ideas often won't align well with our habitual ways of thinking.

Showing how methodological disputes can saturate academic environments, Bharath Sriraman and Matt Roscoe reminded us about the arguments between analytic philosophy

and continental philosophy as well as conflicts in other fields. This particular conflict is a good illustration of the vitriol that can emerge from dogmatic entrenchment within both conceptual frameworks and inquiry paradigms. For example, in the introduction to a massive anthology exploring the tensions between modernism and postmodernism, Cahoone (1996) described the essence of the conflict as follows:

> For some, postmodernism connotes the final escape from the stultifying legacy of modern European theology, metaphysics, authoritarianism, colonialism, racism, and domination. To others it represents the attempt by disgruntled left-wing intellectuals to destroy Western civilization. To yet others it labels a goofy collection of hermetically obscure writers who are really talking about nothing at all. (p. 1)

## Broadening our views of the scientific method

Adding even more important insights to their responses, some of our authors brought up some ways in which narrow visions of the scientific method sometimes limit thinking in our field. For example, Roland Persson saw this as a persistent problem limiting progress in university systems and policy arenas. Ken McCluskey and Taisir Subhi Yamin also weighed in on this, arguing that we shouldn't allow infatuation with our methodology or theories to trap our thinking.

Michael Shaughnessy pointed out that scientific advances sometimes come from observations unguided by formal hypothetico-deductive processes. This insight aligns well with arguments made by the prominent social epidemiologists Wilkinson and Pickett (2009) who responded to critics of their big-picture, pattern-finding research comparing nations according to levels of inequality and social problems. They pointed out that some scientific research can rely primarily on observation, which is the norm in astronomy. They also pointed out that it would be impossible to carry out empirical-experimental studies of the nations they observe because you cannot carve an entire nation, or group of nations, into experimental and control groups and then manipulate socioeconomic variables to discover the outcome.

Physicist, Gregory Derry (1999) expanded our vision of the scientific method even as it applies to the supposedly hyper-mechanistic natural sciences. Engaging in a broad overview of scientific processes and discoveries he illustrated a variety of methods that have been used to reveal discoveries throughout the history of science. In so doing, he established the importance of multiple investigative methods: “science is too wide-ranging, multifaceted, and far too interesting for any single answer to suffice. No simple method of discovery is available for looking up in a recipe book” (p. 11). Here are some of the scientific methods he articulated:

- Hypothetico-deductive work, which typically earns the scientific method label. Scientists make observations, develop hypotheses based on the observations, test and modify hypotheses through experimental procedures, and make predictions based on the results.
- Context-embracing exploration and observation. For example, naturalists such as Alexander von Humboldt and Charles Darwin immersed themselves in complex contexts to discover patterns by generating descriptions and classifications instead of precise conclusions based on experiment.
- Serendipitous surprise emerging through methodical work following a particular idea that produces accidental discovery, such as Roentgen's "accidental" discovery of x-rays.

- The sudden appearance of a problem solution or productive insight after intense, long-term focus on a problem leading to an apparent dead end. The solution often appears in unexpected form, such as an intuitive visualization.

Derry's main point was that common notions of scientific work tend to miss its multidimensionality. The multiple paths to discovery allow for diverse cognitive styles and work habits while occasionally generating arguments over the appropriateness of particular methodologies. So when the more pedestrian thinkers in funding agencies and bureaucracies (such as those lamented by Persson and McCluskey and Subhi Yamin in their response papers) insist that money and attention should go only to "rigorous, scientific" work, they seriously limit the nature of discoveries that can be made about giftedness, talent, and creativity. In essence, they ironically handcuff scientific discovery along these lines by trying to be more scientific.

This form of dogmatism can hurt interdisciplinary work because the pedestrian thinkers who assume that science fits only their truncated version of the scientific method can ignore other forms of discovery such as those highlighted by Derry (1999). One advantage of a fragmented, porous, contested field like gifted education (see Ambrose, VanTassel-Baska, Coleman, & Cross, 2010) is that it will not or cannot habitually reject ideas from foreign disciplines, including methodological procedures from beyond their borders. They are set up to capitalize on the diverse discovery approaches that Bruce Shore helpfully discussed in his response paper. But when pedestrian dogmatists are in charge of funding agencies they close the door on this methodological advantage and leave the fragmented, porous, contested field dominated by its schizophrenic disadvantages. So, interdisciplinary scholars can help gifted education by revealing not just theoretical constructs and research findings from foreign disciplines but also diverse inquiry methods that we can borrow. As Bruce Shore mentioned in his response paper, gifted education already benefits from qualitative research methods borrowed from anthropology. But those benefits did not come easily because qualitative research, rooted in the post-positivist investigative paradigm, faced a very difficult battle for acceptance (see Borland, 1990; Cross, 1990; Coleman, Sanders, & Cross, 1997; Piirto, 1999).

All of this reinforces some points made by Bruce Shore who determined that it is not a big problem if gifted education does not have a single definition, and by Susen Smith and Chinhsieh Lu who suggested that we should accept the diversity of models of giftedness because this might simply reflect the diversity in human nature. Rather than strive for a unified conception of giftedness, we might be better off simply accepting that there are a wide variety of conceptions, each with validity within their own particular cultural and socioeconomic arenas. That was one of my points in the focus article. I think it's dangerous to strive for premature closure in terms of definitions, and my example of cultural anthropology's failed attempt to come to closure on the definition of culture was intended to illustrate that.

## Cultural pressures and dogmatism

While epistemological and methodological concerns seem to be at the center of our angst over clarifications of giftedness and talent, the cultural pressures from external contexts are at least as important. Susen Smith and Chinhsieh Lu reminded us that Roland Persson has carried out important interdisciplinary analyses revealing the dominance of American cultural influences on conceptions of giftedness. Roland's insights gain even more importance when we extend our vision into disciplines that reveal more about the nature of American

influences; for example, the dominance of neoliberal ideology and neoclassical economic theory on American culture (see Ambrose, 2012-a, 2012-b). Neoliberalism and neoclassical economic theory reinforce the notion of the selfish, rational actor so gifted education worldwide might be tainted somewhat by an excessively individualistic and selfish view of giftedness, talent, and creativity.

Slavica Maksić also brought culture into play by considering the nature of multicultural education. I contend that we can clarify multicultural issues considerably by exploring the research and knowledge bases of fields that have to do with cultural issues--fields like sociology, anthropology, history, and economics. Maksić also reminded us of a major initiative aimed at understanding the international impact of culture. Studies by political scientist Ron Inglehart and colleagues based on the world values surveys have shown that some nations adhere to modern-materialist values emphasizing materialistic acquisitiveness while other nations are far ahead in the transition to postmodern, post-materialist values that emphasize quality of life issues, aesthetics, and civic engagement (Inglehart, 1997, 2000; Inglehart & Welzel, 2005). Such differing value systems must exert very different pressures on the discovery of aspirations and the development of talents in gifted young people.

## Abilities required for effective interdisciplinary work

Frédéric Darbellay raised interesting questions about the capacities required for engaging in interdisciplinary research. He speculated that interdisciplinary explorers might be intellectual pioneers similar to early aviators. Along these lines, Darbellay highlighted the emergence of new kinds of researchers deemed *interdisciplinary natives, migrant researchers,* and *indisciplined researchers* who don't lodge themselves in a particular discipline but instead wander throughout the intellectual terrain of multiple disciplines. These interdisciplinary natives likely require healthy doses of tolerance for ambiguity, which is an asset when it comes to creative work. Darbellay also noted that this kind of outside-the-silo work requires interesting combinations of motivation, courage, openness, empathy, tolerance, and other propensities that combine into the core concepts of complexity, values, and creativity. He went on to say that the ability to put oneself in the place of others is an advantage for interdisciplinary scholars. This approximates the intellectual empathy and intellectual humility that Paul and Elder (2013) and Resnick (1987) proposed as important for highly effective critical thinking. Darbellay invoked Visvanathan's (1997) similar concept of cognitive justice, which requires researchers to value the vantage points of those from diverse disciplines.

According to Darbellay, interdisciplinary work also requires the ability to capitalize on creative association. I have found this to be one of the joys of interdisciplinary work. When navigating through the terrain of diverse disciplines one occasionally finds a construct that suggests a vague connection with theory, research, or practical application in gifted education and creative studies. The thrill of discovery takes place when that vague connection emerges into something potentially useful.

Bharath Sriraman and Matt Roscoe emphasized the problem of dogmatic insularity within disciplinary silos while reminding us about the polymathic tendencies of interdisciplinary integrators, especially those who engage in broad interdisciplinary thinking involving syntheses of processes and concepts across the arts, the sciences, and mathematics. This reminder aligns well with the work of Robert and Michelle Root-Bernstein (Root-

Bernstein et al., 2008; Root-Bernstein & Root-Bernstein, 2013) who illustrate the importance of the arts in scientific discovery. Most recently, Robert Root-Bernstein (see Ambrose, 2015) argued that the dispute over domain-general and domain-specific expertise in gifted education and creative studies "is a red herring. Creative people ignore domains. . . . Creativity is problem driven. . . . most problems arise when at the intersections of domains, where our current practices fail and our ignorance is most evident." If he is correct, we must recognize that domains are important but they aren't the be-all and end-all of gifted education and creative studies. We should be paying more attention to the problems that occur at the borders between disciplines where shared expertise might come into play in their solution.

## Macro-contexts and human nature

Concepts that recurred throughout the analyses in the introductory focus article for this special issue, and in this response paper, include the notion that large-scale socioeconomic and cultural pressures can shape the discovery and manifestation of aspirations and talents. Some young people with impressive hidden ability never discover their potential while others might discover it accidentally. In his response paper, Trevor Tebbs described the way in which he uses Glasser's work in relational psychology to help children who do not fit the norm. Broader interdisciplinary exploration can help here as well. Vlad Petre Glăveanu and Maciej Karwowski contributed some of that broad-scope vision by reporting findings showing that creativity improves in poorer countries when the climatic conditions are harsher. This seems to align with research on creative constraints (Haught-Tromp & Stokes, in press; Stokes, 2005). If we want to marry the work on creative constraints with discoveries in gifted education by connecting with yet another body of research, it might be helpful to make those connections with the work of economists who have revealed effects that third world conditions have on entrepreneurship. Mainstream economic thinking about entrepreneurship tends to magnify the importance of entrepreneurs in developed nations while ignoring the phenomenon in the third world. In actuality, there is far more impressive and widespread entrepreneurship in third world nations than there is in the developed nations (Chang, 2010). This interdisciplinary connection could be very important for gifted education because it helps us realize that we likely are magnifying the abilities of the privileged gifted in developed nations while discounting the abilities of the impoverished in underdeveloped regions.

Moving from economics to English literature, Trevor Tebbs also invoked the technically accurate but otherwise barren description of a horse in Thomas Gradgrind's class in Charles Dickens' *Hard Times*. This suggests another connection with the rather barren, rational actor model of the human as portrayed by neoclassical economic theory; however, the student's barren description of the horse at least was technically accurate, for the most part, while the rational actor from economic theory isn't very close at all to capturing the essence of human thought and action. So comparing the satirical insight from English literature with a prominent theory in economics can magnify the flaws in simplistic, hyper-mechanistic conceptions of human nature. Those of us who try to oversimplify human nature in theorizing about giftedness and talent should take note.

## Emphases on practical interdisciplinary work

While I attempted to broaden the scope of thinking in gifted education and related fields by paying most of my attention to theoretical constructs, some of our respondents grounded interdisciplinarity in practicalities. For example, Janna Wardman reminded us that teachers are not employing the research literature in the field nearly as much as they could.

This attention to practicality is very helpful because it enables educators and policymakers to appreciate what can be gained from going beyond the knowledge bases and habitual practices of a few domains. The next section includes some ideas about using interdisciplinary insights to refine practical work in the field.

## Mentoring and counseling

Trevor Tebbs illustrated some ways in which he uses interdisciplinary searches to broaden the data collection he employs to create conceptual portraits of the gifted young people with whom he works. Trevor's impressive Chandelier model is an excellent example of a synthesizing tool based on wide-ranging conceptual explorations (Tebbs, 2014).

Ken McCluskey and Taisir Subhi Yamin provided an overview of another excellent example of practical interdisciplinary work. The *Lost Prizes* initiative, which started at the University of Winnipeg in Canada and has since spread around the world, is a very practical initiative bringing together insights from creative studies, gifted education, general education, and counseling, among other fields to generate practical interventions that discover talent in troubled young people who are on their way to lives of devastation. This holistic, strength-based program successfully rescues psychologically damaged, often incarcerated youth who have unrecognized ability. If this isn't a highly practical example of interdisciplinary synthesizing I don't know what is.

## Teaching strategies

When considering gifted education and general education, teaching strategies are at the core of practicality. Michael Shaughnessy suggested that gifted programs should engage young people in more interdisciplinary work so they can broaden their visions and counterbalance the tendency toward overspecialization. In her interdisciplinary collaboration with natural scientists, Dorothy Sisk said that "one very positive benefit of interdisciplinary work is the sharing of instructional strategies among the disciplines" (p.100). I strongly agree that these kinds of interdisciplinary work and pedagogical collaboration can have very positive effects.

While much of the collaboration tends to involve the borrowing of extant teaching strategies, we actually can use interdisciplinary exploration to *create* new strategies. For example, in my extensive interdisciplinary wanderings I kept coming across new constructs that, with a little tweaking, could be turned into creative and critical thinking tools for the classroom. After collecting a large number of these I compiled them into a book manuscript, which is nearing completion (Ambrose, 2016). This book includes refinements of existing teaching strategies to make them more conducive to content mastery and creative and critical thinking. But the bulk of the text is comprised of new teaching strategies inspired by concepts from diverse disciplines. Examples include metapattern analysis (from biology); chaos-complexity-order analysis (from complexity theory); altruistic analysis (from psychology and primatology); aggressive-assertive-passive analysis (from psychology); worldview analysis (from philosophy); and many more.

## Adapting instructional strategies to interdisciplinary work

I originally created these new teaching strategies as tools for K-12 and college-level classrooms. But now the discussions of practical interdisciplinary work generated by the responding authors in this special issue are making me think about the new teaching strategies as tools for interdisciplinary teams to use in their explorations of complex

phenomena that transcend disciplinary borders. As mentioned in my focus article at the beginning of this issue, the past president of the National Science Foundation, Subra Suresh (2013), argues that the new way of doing science in the 21st century requires interdisciplinary, international collaboration. Much of this collaboration arises from unpredictable, electronic networking. Imagine that interdisciplinary teams are given process tools that can make their networked collaboration more systematic. Here I provide a few examples of ways in which the refined and invented teaching strategies might be employed by interdisciplinary teams of scholars and scientists that are working on complex, difficult problems and opportunities.

## The Chaos-Complexity-Order Continuum

Slavica Maksić expressed appreciation for the use of complexity theory in the interdisciplinary analysis in my focus article but preferred something more practical when it comes to thinking about the development of gifted individuals. I agree, so that's why I have turned a continuum from complexity theory into a practical teaching strategy: the chaos-complexity-order analysis model. This continuum, derived from the chaos-order hypothesis (see Kauffman, 1995; Langton, 1990; Packard, 1988; Waldrop, 1992), is a powerful explanatory framework for diverse phenomena in a wide variety of disciplines. Essentially, it clarifies how complex adaptive systems that are too orderly or too chaotic cannot evolve and adapt to changing conditions, but they become highly successful in complex environments when they find the edge of chaos where order and chaos are in exquisite balance.

I turned the continuum into a teaching strategy that can be applied to various phenomena in different subject areas. For example, students of history can analyze various governments to determine where they fell on the continuum and what results ensued. Did the central planning of the government of the Soviet Union make it excessively ordered and thus maladaptive in the face of changing socioeconomic and political conditions? Are nations that are suffering from anarchy (e.g., Somalia) excessively chaotic and also maladaptive? Does the balance between socialized government benefits/regulations and entrepreneurial capitalism in the social democracies of Scandinavia partially explain why they are the most successful nations in terms of adapting to complex socioeconomic conditions in the 21st century?

Now let's take the chaos-complexity-order continuum and think about its application by teams of scholars exploring other transdisciplinary phenomena. Assume that a group of economists, political scientists, historians, and sociologists are attempting to discover what economic systems might be best adapted to 21st-century socioeconomic, political, and cultural systems. They might discover that a prominent, interdisciplinary group of scholars determined that neoclassical economics is a unified, insular, firmly policed discipline as opposed to some other disciplines that are fragmented, porous, and contested (Bender & Schorske, 1997). Using the chaos-complexity-order continuum they might determine that unified, insular, firmly policed disciplines are excessively ordered and consequently less effective than they should be when it comes to grappling with complex phenomena. They are less effective because they force fit those phenomena into preconceived conceptual frameworks. This represents excessive theoretical order because it closes down the possibility of making important discoveries about those phenomena. They also conclude that an excessively deregulated economy might become too chaotic, as occurred during the deregulation frenzy that led up to the 2008 economic collapse (see Stiglitz, 2012). Thinking about complex economic phenomena through the lens of the chaos-complexity-order teaching strategy could give an interdisciplinary team a useful heuristic for theoretical work

that could lead to productive empirical discoveries.

## Interdisciplinary teams and gifted education

Both Bruce Shore and Connie Phelps drew examples from medical fields to illustrate some ways in which practical, professional work can be done through interdisciplinary means. These examples are helpful when we consider the need for more interdisciplinary collaboration in education, especially in gifted education. One teaching strategy that has strong potential for scaffolding the work of interdisciplinary teams within and beyond gifted education is the integrative model, which enables teams of students to carry out collaborative research into the intricacies of a particular topic (see Estes, Mintz & Gunter, 2011). After engaging in some initial research about the topic the students and their teacher create a table that includes research questions about the topic across the top and subcategories of the topic down the side. Table 1 (derived from Ambrose, 2016) shows such a table generated by a hypothetical group of middle school students who are studying exploration of the New World.

**Table 1:** Example of an integrative array with a few of the many answers loaded into the cells. (When complete each cell of the table would include anywhere up to about 20 research findings.)

| | **Research Questions** | | | | |
|---|---|---|---|---|---|
| **Subcategories (student groups)** | | Hardships they faced? | Contributions to home nations? | Effects on indigenous populations? | What terrain did they explore? |
| | English Explorers | | Set stage for the empire; | Displaced natives; illness; genocide… | Central & Western Canada; Eastern USA; parts of S. America… |
| | Spanish Explorers | Hot jungle climates; high expectations from home… | Enriched with gold… | Slavery; forced religious conversion; illness… | |
| | French Explorers | | | Intermarriage in W. Canada (Metis); illness… | Canada & Central USA… |
| | Portugese Explorers | | | | |
| | Dutch Explorers | | | | NY region & part of S. America… |

Each group of students is responsible for answering the questions across the top of the table to fill in the cells of their row of the table. So the team carrying out research on English explorers of the New World would read about Henry Hudson, Alexander Mackenzie, James Cook, and others to discover where their explorations took place, what impact their explorations had on indigenous populations, and more. As the students' table fills up with the data, they begin to compare and contrast their findings by looking down the columns. In the "hardships" column they discover that English explorers often had to contend with Arctic conditions while Spanish explorers suffered from tropical diseases. The comparison-contrast processes generated by the integrative table produce some of the most interesting insights about the topic under study.

Now imagine an interdisciplinary team of researchers who are studying the nature of

giftedness and talent. They generate a long list of questions and choose some of them to put across the top of an integrative table. Here are some of the selected questions: How does motivation come into play when we consider the gifted and talented? What influence does socioeconomic status have on the gifted and talented? What physiological factors are relevant to studies of giftedness and talent? What social and emotional dynamics come into play when highly intelligent or exceptionally talented young people are going through school?

Instead of groups of students taking responsibility for a subtopic under the umbrella topic of study, our interdisciplinary group breaks into discipline-specific teams that carry our research and fill in their rows in the table. So the first row of the table represents educational researchers. The second row belongs to a team of economists. The third row is for a group of political scientists. The fourth row belongs to a group of philosophers, the fifth row is for neuroscientists, and so on. The process gets interesting when each team carries out its research filling in the cells of the table. Obviously, the neuroscience team is going to load a great deal of data into the cell of the table at the juncture of neuroscience and the physiological question. They might load a few research findings into a few of the other cells.

For example, they will be able to clarify that socioeconomic deprivation has a suppressive effect on brain development (Hair, Hanson, Wolfe , & Pollak, 2015). Meanwhile, the team of political scientists adds some of their research findings to the cell where their row intersects with the "motivation" question. They clarify that students from deprived populations in nations that are nearing totalitarianism likely have little opportunity to discover productive aspirations because their lives are excessively controlled by autocrats and/or plutocrats (Hacker & Pierson, 2010). These findings, and many others generated by the various teams, can help researchers and theorists in the field of gifted education work to discover and address suppressive influences on child development.

**Table 2:** Example of an integrative array for scaffolding collaborative interdisciplinary research into giftedness and talent.

| | | **Research Questions** | | | |
|---|---|---|---|---|---|
| **Subcategories (disciplines)** | | **Motivation?** | **SES?** | **Physiology?** | **Social-emotional?** |
| | **Educational researchers** | | | | |
| | **Economists** | | | | |
| | **Political scientists** | | | | |
| | **Philosophers** | | | | |
| | **Neuroscientists** | | | | |

## Global awareness and 21st-century problem solving

Finally, we come to what might be the most important application of interdisciplinary research to the clarification of giftedness and talent development. If bright young people lack big-picture awareness and ethical development, they might end up severely hurting themselves and millions of others when they become adults and assume positions of power in society. Several respondents including Susen Smith and Chinhsieh Lu, Dorothy Sisk, and John P. Anchan highlighted the importance of addressing global issues in the 21st century. Both Sisk and Anchan argued that interdisciplinary work ultimately can provide much of the basis for big-picture thinking and large-scale problem solving at the global level. For

example, Sisk claimed that interdisciplinary initiatives can help young people become interculturally and globally competent. She also highlighted the work of the International Center for Innovation in Education (ICIE) and the World Council for Gifted and Talented Children along these lines. Taisir Subhi Yamin, Ken McCluskey, Todd Lubart, Sandra Linke, Heinz Neber, and others are to be commended for taking strong international leadership roles in these organizations because global awareness and international problem solving are vitally important in the 21st century, to the point where they might determine whether or not civilizations will collapse along with the ecosystem some time in the near future. As mentioned in the focus article, Robert Sternberg and I are attempting to shed more light on the viability of our civilization with two interdisciplinary book projects on the ways in which 21st-century globalization is influencing giftedness, talent development, and creativity (see Ambrose & Sternberg, in press-a, in press-b).

## Ethics and compassion

Trevor Tebbs extended our vision into a discipline not normally thought of as framing the ethical dimensions of academic concepts such as giftedness and talent. He took us into English literature, more specifically the work of Charles Dickens who satirized the cruelty of extreme inequality in the Victorian era. Invoking Dickensian literature can make us more likely to recognize recent work in economics, sociology, political science, social epidemiology, and other fields that reveal the pernicious effects of inequality on the discovery of aspirations and development of talents (See Ambrose, 2012-a, 2012-b; Chang, 2010; Hacker & Pierson, 2010; Stiglitz, 2012). For example, political scientist Ian Shapiro (2003) highlighted a modern Dickensian phenomenon in which the privileged tend to ignore or even denigrate the deprived because enormous *empathy gulfs* separate populations on the basis of socioeconomic status in highly unequal nations that are suffering from the erosion of democracy. Understanding the nature of empathy gulfs might make policymakers, educators, and parents more likely to recognize the existence of giftedness and talent in deprived populations. This in turn might augment the work of the previously mentioned Lost Prizes initiative and the International Center for Innovation in Education (ICIE) as they strive to develop collaboration, compassion, and ethics in today's world (see McCluskey & Subhi Yamin, this issue).

Vlad Petre Glăveanu and Maciej Karwowski discussed the dark side of creativity as portrayed by Cropley, Cropley, Kaufman, and Runco (2010). Interdisciplinary investigations can reveal sociopolitical, economic, and cultural phenomena that can pressure creators to make their work more beneficial in an ethical sense or more harmful by aligning with the dark side of creativity. An example might include dark, creative leadership when resurgences of warlike romanticism arise in nations as populations forget about the horrors of war from decades past (Fletcher, 2002). Another example might include dogmatic economic theory pressuring individuals to become more selfish and manipulative in their creative work to the point where they rob millions blind with deceptive financial instruments while enriching themselves during the 2008 economic crash (Stiglitz, 2012).

This reaction to the response articles in this special issue could go on for thousands of pages more, for two reasons. First, the respondents generated a wide variety of very interesting ideas about the potential and pitfalls of interdisciplinary work applied to the extension of our knowledge of giftedness, talent development, and creativity. Second, as can be seen from perusal of this special issue, traveling beyond the borders of our specialized domains is much like setting sail across the Atlantic, or around the horn of Africa in the 17th

century. While our home domain-specific territories are complex enough for more than a lifetime of exploration, the expansion of our vision through the exploration of foreign disciplinary territories, known and unknown, magnifies the possibilities for discovery exponentially. If we are intolerant of ambiguity we will fear the horizon and want to turn our sturdy but narrow epistemological ships back toward home. In spite of the risk, I recommend that at least some of us sail off toward the horizon so we might return with theoretical and research-based silks and spices for the enrichment of our field.

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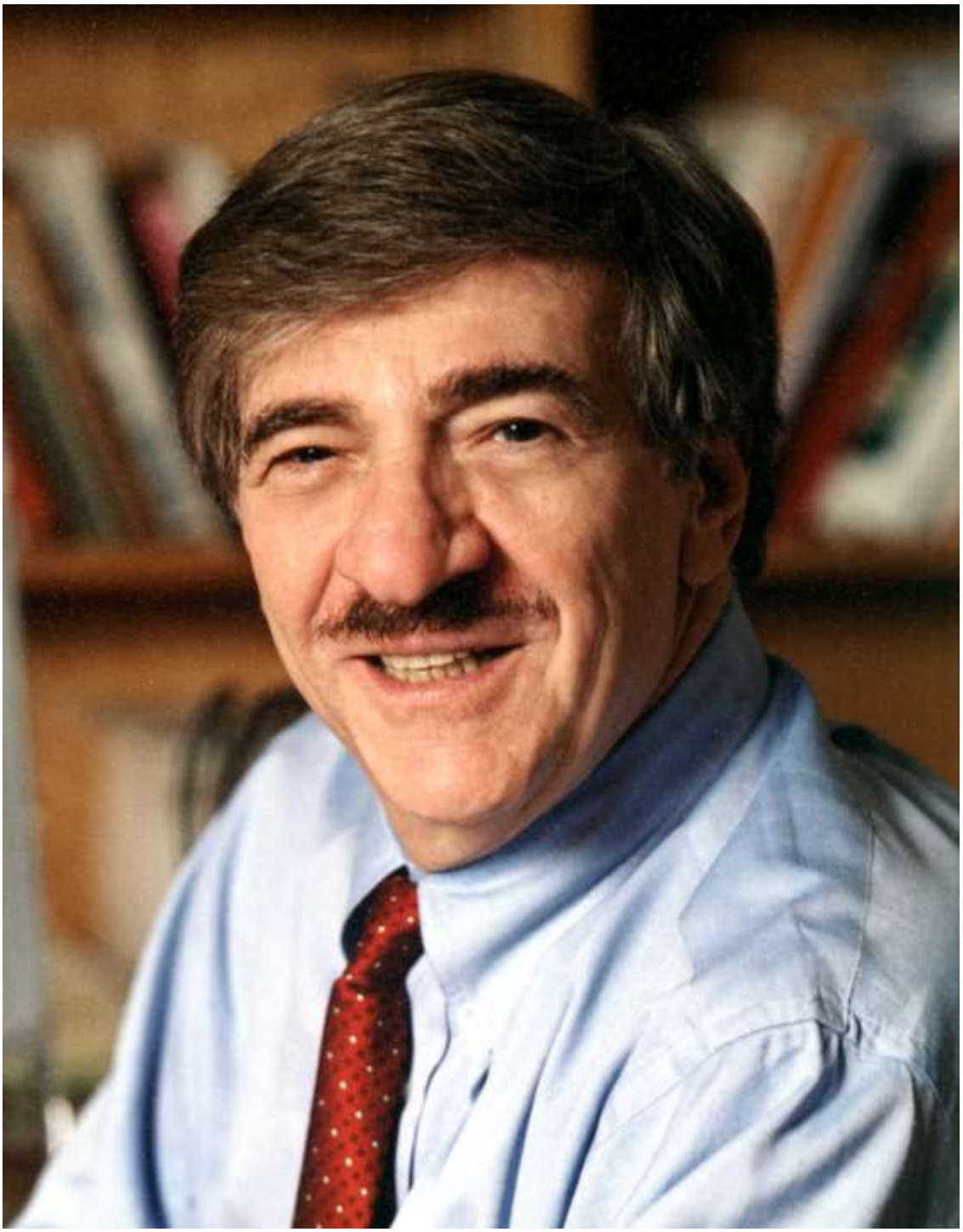
**Profiles of Creativity:**

# Joseph S. Renzulli

**Sally M. Reis**
Vice Provost of Academic Affairs, University of Connecticut, Storrs, USA



I met Joe soon after I moved back to my Connecticut hometown from Pittsburgh, Pennsylvania. I had become interested in gifted and talented students as a result, like so many of my colleagues, of my work as an English teacher in a large public junior high school that served students in grades 7-9. I had the classic exposure to the need to know more about gifted education—an incredibly smart and turned-off student who had absolutely no interest in learning anything in my class and whose motivation was waning by the day. Reading about what to do with gifted students brought me to the work of James Gallagher and classes at the University of Pittsburgh in gifted education. Eventually, Jack Birch, at the University of Pittsburgh, recommended that when I returned to my home state of Connecticut (CT) I contact a young guy at the University of Connecticut (UConn) named Joe Renzulli. I did just that and in 1976, Joe sent me a mimeographed copy of a two -part article he had written on *The Enrichment Triad Model.* This was my first exposure to his work and the ideas that would influence the rest of my professional and personal life.

As I had already taken a couple classes in this area, and had become interested in learning more, I asked him about additional classes at UConn and instead, he sent me to Southern Connecticut State University and Dr. Linda Smith who had begun teaching graduate classes there and needed more students. One of Joe's most endearing characteristics is the generosity with which he helps his former and current students. So rather than register for one of Joe's classes, I ended up enrolling in classes at Southern with Linda and within a year, I had talked three of my friends, all of whom were interested in gifted and talented students into joining me on my weekly trek to New Haven, CT. Peg Beecher, Mary Cianciolo, and Sandy Turnquist Buckland and I traveled together, stopping to eat well and laughing most of the

way down to our classes. We were young, irreverent, and considered ourselves wildly creative teachers. It was in one of those classes that I met Joe, who was invited to give a guest lecture.

Joe and I have been best friends for a very long time. What I love most about him is his remarkable energy and passion for life—for his wife and children and family, as well as his work, ideas, cooking, love of travel, excitement in small victories, and for his constant quest to evolve. I also take pride in the joy he feels related to the outcomes of his successful work, as he loves seeing the many and diverse ways that students complete in-depth projects. He is passionate about the schools that use the Schoolwide Enrichment Model, and all the administrators and teachers who seek a better way of engaging and enriching their students' experiences. He loves people who question authority, especially when that authority results in rigid and non-creative educational experiences for young people. Joe's ideas ignited my own—as a teacher of gifted students in my own hometown of Torrington, CT and then I became a coordinator, and then I became a researcher and his partner in work and life.

Joe became and remains an ardent supporter of educators who question the status quo and are not afraid to work and fight for change. He has always looked for and brought out the best in those with whom he works. His questions and quest for excellence have made my work stronger but at the end of over three decades together, he is still my best friend and our marriage is strong and happy. What makes me proudest of him? So many things come to mind--his need to evolve and change and improve based on data and field testing, his passion for me and our family, his life and his work, his ability to be steadfast and noble, his creativity and constant need for movement in a new direction, and perhaps, most of all, his intellectual curiosity. In this book, you will see the evolution of some of his ideas and also, some of the refinements that emerged because of his need to conduct research that became the cornerstone of his work. If his initial ideas are not practical or easy to implement by teachers, they are eventually discarded in favor of finding ones that can be more simply implemented in schools.

In the sections that follow, and as a tribute to Joe's work, you will hear from a few of our favorite collaborators and friends, including well-known scholars such as Robert Sternberg, Sandra Kaplan, and Carolyn Callahan. You will also hear from some of our colleagues at the Neag Center and former very successful graduate students (Del Siegle, Betsy McCoach, and Jean Gubbins, Sue Baum). You will also hear from one of our favorite Deans of the Neag School of Education.

I hope that these brief tributes, as well as a few stories about the ideas that guide Joe's work, will be a meaningful introduction to this volume, which he tells me will be his last book (but I am not sure that I really believe that). And so, you will learn more about the love of my life, my greatest mentor and teacher, my wonderful, loyal, and creative husband, who is still an inspiration and a source of pride and joy for me every day. After 30 years of marriage, I am still grateful to share both our personal life and work—Joe's creativity and optimism enrich my life and the lives of our family and colleagues each and every day.

## Some Personal Observations from Very Special Friends

**Robert Sternberg**
***Cornell University, Ithaca, New York, United States***

Joe Renzulli has had the career almost all of us academics, including myself, wish we had had. The field of gifted education has had many scholars to work in it, but how many to

date truly have had *profound and lasting* impact? Really, I think there have been only two giants in the field—Lewis Terman and Joseph Renzulli. Terman's study, oddly enough, was not even well done, but it has had enormous impact on the field and countered stereotypes that gifted people are sickly, maladjusted, or just plain bizarre. In the field of the gifted, though, Terman was a one-shot deal. His main interests were elsewhere. Joseph Renzulli, in contrast, has presented us all with a career-long succession of ideas, many developed in collaboration with others and especially Sally Reis—the three-ring model, curriculum compacting, the schoolwide enrichment model, the houndstooth model—to name just a few. Had Joe's contributions been limited to scholarly ones, he would have been, just for those, the most eminent scholar ever in the field of gifted education. However, Joe has been unique in seeing more positive outreach and implementation of his ideas than any other scholar I can think of. His ideas combine scholarly integrity with practical applicability. Other scholars have seen their ideas implemented, but usually in limited ways and for short periods of time. Sometimes.ometimes, the ideas that have been implemented were true flashes in the pan (such as the implementations of Guilford's ideas, which were based on a theory that was demonstrably false). In Joe's case, the implementations have spread because they are teachable to teachers, practical to implement, fun for students and most of all, because they work. Had Joe's work been limited to his scholarly and outreach contributions, he would have been by far the greatest of contributors to the study of the gifted. But that's not all. His Confratute, run over three decades in collaboration with Sally Reis, has trained more skilled practitioners in the field of giftedness than any university ever has or could. So in all three domains of scholarly activity—research, outreach, and teaching—Joe has been at the top of the field. That's well, ridiculous. Who else in any field could make that claim? I cannot wear a hat, because if I wore a hat I would have to take it off to Joe Renzulli, with the result that it would always be off my head. Joe's contributions really are unique, in my view, in the world.

## Susan Baum

***Bridges Academy, Studio City, California, United States***

It is an honor to be able to talk about the impact Joe's work has had on education and my work, specifically. I originally came to study at the University of Connecticut because of reading the *Enrichment Triad Model* (1977). This model highlighted the value of authentic learning where students are "practicing professionals' as they become problem solvers and creative producers. This model enabled me to understand how learning could be authentic and purposeful. Having a personal interest in students with gifts and talents who also were challenged by learning difficulties, I realized that here was a model that could allow children to learn and engage in creative productivity that aligned to their abilities instead of their being forever trapped by their disabilities. Over the years, as Joe expanded his basic idea in this seminal work to create the *Schoolwide Enrichment Model* and to promote the idea that schools should be about talent development rather than remediation, I have applied his ideas to make a difference in the lives of all children but especially those who we now call twice exceptional.

Currently in my role of Director at the 2E Center for Research and Development at Bridges Academy , a school for twice exceptional students in Studio City, California, I have been able to witness the power of talent development. We have instituted a strength based, talent-focused program based on Joe's model. Not surprisingly, when these twice exceptional students are engaged in talent development opportunities (TDO) such as enrichment clusters, we have found them to be more focused and productive in contrast to their behaviors in other learning contexts. These TDOs are also therapeutic especially when the students are feeling anxious and depressed due to their struggles with their learning differences. By offering them

a break from their program and substituting an opportunity to explore their strengths, interests, and talents, they are able to refocus and regain their confidence. Focusing on what these exceptional students can do builds their hope and encouragement.

Interesting to me is that Joe's ongoing claim that schools should be about talent development is finally gaining recognition by forward thinking educators today. These innovators are embracing talent development and creative production. We see schools adopting "genius hour", creating makers' spaces, and advocating for authentic learning—the very same ideas that Joe has developed and promoted over the course of his career. Indeed, to me, Joe's transformative ideas were truly visionary, thus paving the way for what education is becoming.

## Carolyn Callahan

***University of Virginia, Charlottsville, Virginia, United States***

When I first met Joe Renzulli I was a young, undergraduate student responding to a work-study posting to help analyze math test score data. Little did I know where that one interview would lead or who this man was who invited me into his world. Since taking what appeared to be a small step in my life, I have discovered over and over again that it was one of the most significant events in my career and in my personal life. I have come to appreciate and have benefitted in ways that cannot be counted from the unbounded generosity of a man who has offered me a model of what it means to be committed and passionate about education; to have a deep and abiding concern about students from every race, every socio-economic background, and gender; who respects teachers for what they do and believes in their ability to do so much more; who shares opportunities graciously and openly with students and colleagues; who is truly joyful when he can make the potential of a child come to fruition through educational experience; and who will fight tirelessly to ensure opportunity for his students, his colleagues, and most of all, for children with potential. Others will, I am sure, regale Joe for his intellectual and creative contributions. He deserves all of that praise that can come his way. But in his spirit, I hope this brief missive conveys the breadth of his personal character that makes him more just a theory developer, a researcher or an author, but rather a distinguished educator and a truly good and noble human being.

## E. Jean Gubbins

***University of Connecticut***

*Your talent determines what you can do. Your motivation determines how much you are willing to do. Your attitude determines how well you do it."* —Lou Holtz

As a Talent Developer, Joe is one of a kind. I have read thousands of pages of books and articles written by Joe Renzulli. I have listened to hundreds of his presentations in venues in the United States and abroad. I have field-tested many of his ideas with students. Additionally, I have co-taught or co-presented with him about his theoretical and practical systems and models that make a difference in how children and their teachers learnOver four decades, I have witnessed how Joe builds theories, conducts the requisite research, revises his ideas, and implements his models in schools. The typical research/practice divide does not exist as each step in creating the Enrichment Triad Model, the Revolving Door Identification Model, Schools for Talent Development, and Schoolwide Enrichment Model was a carefully thought out process in the "secret laboratory of his mind."

Joe writes and speaks about his ideas as they evolve and asks others for their perspectives. When he shares a draft about his new ideas, many of us view it as a final draft as the words and messages are so finely tuned. Joe is the ultimate scholar, researcher, and

writer. Academe has become his "playground" for designing ways to promote opportunities to learn at high levels.

Joe never settles for education as is. He always strives for what it could be. He asks the tough questions about our field of gifted education and talent development. When other researchers and scholars were "comfortable" with IQ as the way to confirm a child's designation as gifted, Joe turned to the research literature to find out what was known and not known. By raising legitimate and insightful questions, he wondered, "What Makes Giftedness?" This question opened up multiple pathways to teaching and learning.

Joe's obvious talent as a writer, his motivation to make a difference in the lives of students and their teachers, and his dedication are unstoppable. As a former graduate student and a current colleague, I can look at my bookcase containing many of his books or check my collection of articles and confirm that as a talent developer, Joe Renzulli is "one of a kind."

## Del Siegle

***University of Connecticut, USA***

Very few individuals produce work that challenges conventional wisdom and then changes the course of an entire field. Joe Renzulli is such an individual in gifted education. His *Three Ring Conception of Giftedness* and his emphasis on the importance of talent development have left indelible marks. With his soulmate, Sally Reis, he has developed educational practices based on their *Schoolwide Enrichment Model* that encourage creative productivity and achievement excellence in young people.

Joe Renzulli's strengths are his creative innovation, knack for making ideas useful, and collaborative working style. Not only does Renzulli stand out for his innovative ideas, he also stands out for his ability to implement those ideas in practical ways that improve students' learning experiences. Through the entire process he freely shares his ideas and encourages feedback from others.

My life has been enriched by his unwavering support and friendship. My work has been influenced by his resolve that students who participate in enjoyable and relevant learning experiences are more engaged and achieve more. Through our research, we have learned that students who find school meaningful are less likely to underachieve. We have also learned that making school meaning can reverse underachievement. We have learned that the more knowledgeable and passionate teachers are the better able they are to share content in meaningful ways that motivate students. Others', and our work, validate what Joe Renzulli has been advocating for five decades: enjoyment encourages engagement that results in both enthusiasm for learning and greater achievement.

## Betsy McCoach

***University of Connecticut, USA***

No single scholar in the last 50 years has had as profound an impact on the field of gifted education as Joe Renzulli. The three ring conception of giftedness (1978) revolutionized the field of gifted education and ushered in an era marked by more inclusive approaches to gifted identification and services. This landmark paper also laid the groundwork for most current conceptions of talent development and differentiation. My own work (with Peters, Matthews, and McBee) on an "advanced academics" approach to service delivery rests squarely on the shoulders of Joe Renzulli (a point that I made repeatedly to my co-authors as we were writing the book). I am proud to have studied under Joe Renzulli, and

I am incredibly fortunate to now be his colleague and his friend. But this familiarity with Joe does not diminish the awe that I feel for one of our field's greatest thinkers and leaders.


## Sandra Kaplan

***University of Southern California, Los Angeles, California, USA***


There are people who ignite your own interests and abilities. There are people whose ideas provide the foundation to affirm your own ideas and give them greater credibility. There are people whose creativity serves as the fodder for your own creative expressions. There are people whose recognition of your work is the catalyst for the recognition you have received from others. The contributions of these people provide both the formal and causal encounters that significantly affect your own productivity. Joseph Renzulli has been that person for me. Whether it was at a Curriculum Council meeting in Washington, a conversation in the living room of a home in Tehran, an ideational disagreement while eating spaghetti at a conference scheduled dinner party, or a quiet sharing of "what's next in gifted" during a brief encounter at Confratute, these academic interactions with Joseph Renzulli have been and still remain the basis of much of my own productivity. His large and profound body of work has been and continues to be the impetus for the work of others. Like many professionals, I have been fortunate and have relished the opportunity to reap the benefits of Joseph Renzulli's profound and significant work in the field of gifted education.


## Richard Schwab,

***Dean of the Neag School of Education, University of Connecticut, Storrs, CT, USA***


Ask any teacher of gifted and talented students in the world who the most influential scholar in their field is and most likely the name will be Joe Renzulli. In my travels around the globe – from Qatar to California – when educators find out I from the University of Connecticut, the conversation often turns to our reputation as a world center for gifted education. The conversation centers not only on Joe's work in gifted education, but also his longstanding impact as an educational reformer and innovator. Over the course of more than 50 years of scholarship, advocacy, and program building, Joe has transformed the way we think about developing the talents and gifts of all children – not only those considered gifted.

When I met Joe 40 years ago as a graduate student, he was already established as an international scholar. Over the past four decades, his research, grant, and publication productivity have continued to grow exponentially. Joe remains a highly respected scholar and educational reformer, impacting classrooms worldwide. His enduring success stems from the fact that, in addition to being an active researcher, he is also an extremely effective leader.

Great leaders share the following attributes: First, they must have something important to say. Joe is a brilliant researcher, thinker, and prolific writer who can back what he advocates with defensible data. Second, having something to say is only as meaningful as the ability to communicate one's thinking. Joe's writing, as well as his public speaking, resonates with academics, practitioners, parents, and policymakers alike. Third, a great leader works with others to expand their thinking while helping them to grow as individuals. Joe brings a spirit of collaboration that draws out the gifts and talents of all who work with him by practicing what he preaches about how people learn and grow. Over the years, Joe and his colleagues at the Neag Center for Gifted Education and Talent Development, as well as around the globe, have not only furthered his ideas, but also created and developed their own work in this area, which is recognized worldwide. A prime example of this is the work that Sally Reis has generated over the years. Together, Joe and Sally have created and tested such

transformative models of reform as the School Enrichment Model. At the same time, Sally's efforts in educating young women has established her internationally among the most recognized leading scholars in the education of girls.

And yet Joe possesses one more trait that not all great leaders share – a trait that has sustained his working relationships with eminent scholars, and educational leaders to teachers. Joe is a caring, loyal, and compassionate person who cares deeply about social justice for all.

Joe's work has thrived through multiple rounds of reform movements – from open classrooms and repeated back-to-basics movements to, more recently, the high-stakes testing and accountability era. His work persists because it is research-based, logical, and meaningful; it embodies what we would like all of our children to experience in their own education – a sense of joy in learning and creating new knowledge. Joe Renzulli will be undoubtedly be renowned as one history's most distinguished educational reformers –among the likes of John Dewey and Maria Montessori – and his influence is sure to endure well into the future.

## About the Author

**Sally M. Reis** is Vice Provost of Academic Affairs and a Board of Trustees Distinguished Professor at The University of Connecticut. She is past Department Head of the Educational Psychology Department, where she also serves as a Principal Investigator for the National Research Center on the Gifted and Talented. Dr. Reis was a teacher for 15 years, 11 of which were spent working with gifted students at the elementary, junior high, and high school levels. She has authored or co-authored more than 130 articles, 14 books, 60 book chapters, and numerous monographs and technical reports. Her most recent work is a computer-based assessment of student strengths integrated with an Internet based search engine that matches enrichment activities and resources with individual student profiles. Dr. Reis is the Co-Director of Confratute, the longest running summer institute in the development of gifts and talents. She is co-author of *The Schoolwide Enrichment Model*, *The Secondary Triad Model*, and *Dilemmas in Talent Development in the Middle Years*. Sally serves on several editorial boards, including the *Gifted Child Quarterly*, and is a past President of the National Association for Gifted Children. Dr. Reis was recently honored with the highest award in her field as the Distinguished Scholar of the National Association for Gifted Children and named a fellow of the American Psychological Association.

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**Book Review (1):**

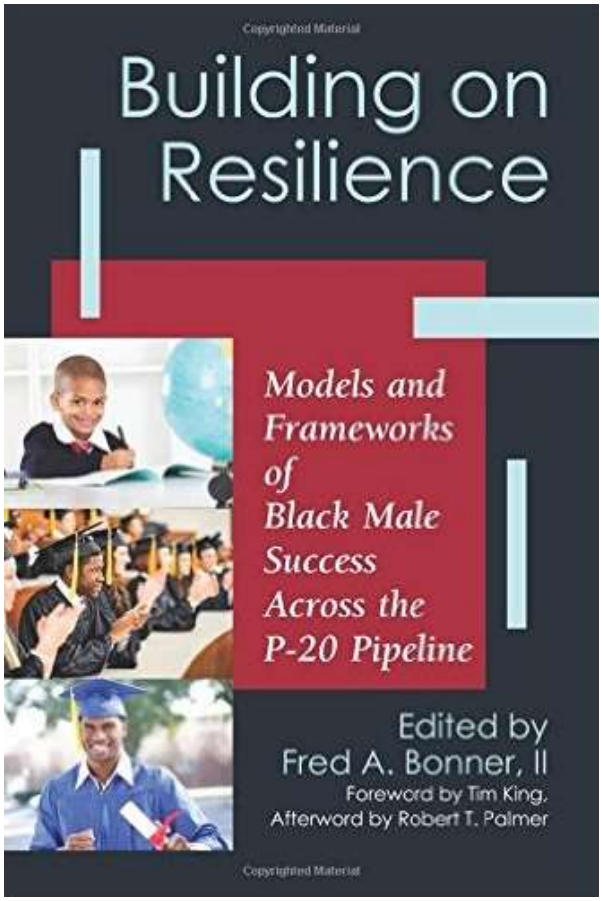
# Building on Resilience, Models and Frameworks of Black Male Success Across the P-20 Pipeline

**Fred A. Bonner II (Editor, 2015)**

**Derek Irvin; Tammy Lane; Kenneth Hines**
Prairie View A&M University, Prairie View, Texas

## Introduction

*Building on Resilience, Models and Frameworks of Black Male Success across the P-20 Pipeline*, was an excellent read. The book is divided into two parts which includes a total of 13 chapters, an introduction, and an open letter. Part 1 offers frameworks and models for P-12 education contexts. Part 2 offers frameworks and models for postsecondary education settings. *Building on Resilience* consisted of a compilation of research *not* on a failed public education system, but offered a look closely at successes realized through practical and proven educational experiences. These educational frameworks are centered on the academic success of African-American males from pre-school through college and/or university levels. As there is a plethora of research that speaks to the deficits of African-American male students across the P-20 pipeline, this book was a departure from these commonly accepted narratives.




The introduction is titled *Strengthening the pipeline: A need for Frameworks and Models in Black Male Research*, Fred A. Bonner II encourages the divining of a solution that will address the deficit narrative often conveyed through discourse related to the metaphorical school to prison pipeline. In order to tackle this lofty goal, Bonner invokes author Stephen Covey's wisdom with the quote "…begin with the end in mind" (p.1). Bonner continues with encouraging the question, "What is the end that is sought for Black males in schooling contexts?" In terms of

success, he asks a most pointed and important question, "What is our definition of success?"

In chapter 1, *A Framework for Black Males in P-12 Urban School Districts*, Sharon Michael-Chadwell postulated that in more than 16,000 school districts in the United States and since the 1980s, Black males in P-12 educational systems have been identified as being underachievers. Michael-Chadwell continued by stating that this underachievement is linked to Black males experiencing "higher rates of suspensions, expulsions, non-promotions, dropouts, special education placements, and the lowest rates of secondary school graduation (p.13). Consequently, Michael-Chadwell offers three theories as tools towards understanding the plight and education of Black males in schools. They include: Social Dominance Theory (SDT), Social Cognitive Theory, and Critical Race Theory (CRT).

In chapter 2, *A Framework for Thinking and Talking about Race with Teachers*, H. Richard Milner, Quaylan Allen, and Ebony McGee argue that educators in P-12 settings often struggle to develop curriculum and instructional practices that meet the needs of Black male students – particularly related to issues centered on race (p. 25). The authors spoke to their understanding of other identity markers such as gender, sexual orientation, religion, and socioeconomic status and how it shaped the lives of Black males. The authors keenly focused on race because it was viewed as a constant thread across the other identity markers/spaces (p.28).

In chapter 3, *Parent Advocacy for Black Males in Gifted and Advanced Programs*, Grantham, Johnson, Roberts-Dixon, and Bridges indict educators for not effectively meeting the academic needs of a large number of Black males. The authors also made mention of President Barack Obama's *White House Initiative on Educational Excellence for African Americans*. This initiative calls for the enhancement of opportunities - both educational and lived experiences.

In chapter 4, *Missing in Action: African American Males in Gifted Education*, Donna Ford, Trenton Marsh, Jerell Blakeley, and Stanford Amos, resolutely call for the identification and gifted education of neglected gifted Black males; additionally, the authors challenge the perception that gifted students come in the form of an archetype. The authors offer omnipresent narratives that clearly illustrate how erroneously labeled. Black male students, who are gifted academically as well as socially, often "go off the radar screen", with their accomplishments never being acknowledged. This is in part, an outcome of "deficit" views, racism, social controls, faulty assessment, elitism, the lack of social supporters and resources, stereotyped perspectives of educators and administrators, and inadequate educational and civil Rights policies. Instructively, the authors conclude the chapter with offering concrete solutions to address the phenomenon of the unsung Black male who is often absent from gifted education.

Due to the concerns of an educator in rural Alabama and an inquisitive professor, the educational trajectory of a gifted Black male is explored as detailed in Thomas Hébert's, *An Examination of the Lived Experience of a Gifted Black Child in Rural Poverty*. Hébert showcases the social and academic development of a gifted Black male student who is plagued with an absent parent, extreme poverty, a school system with limited resources, as well as being noncompliant with gifted education mandates. Furthermore, the gifted student is stigmatized by teachers, administrators, and in his own community. In chapter 5, the author effectively demonstrates how time sensitive gifted education, attentive teachers, support systems outside of the family as well

as school developed support programs are significant in shaping identity, building social value, emerging talent and increasing academic achievement of gifted Black males.

In response to the myth that teacher effectiveness in relation to the education of Black males does not depends on "race, culture, and class differences", in chapter 6, *The Scholar Identity Model: Black Male Success in the K-12 Context*, Gilman Whiting presents statistical data that demonstrates the dominance of White female teachers in the profession. An implication of this is that all teachers must learn to recognize and cultivate the talents of Black male students (p. 89). Additionally, the tenets of Whiting's Scholar Identity Model (SIM) is a resourceful tool to help hone in on the academic identity of Black males, which is significant in distinguishing and fostering their giftedness. The model elaborates on nine concepts and four pillars that must become staples in the lives of gifted Black males as well as recognized and supported by their allies. The chapter is pertinent in that it describes in detail the benefits of each SIM concept in cultivating a scholar identity. The model is also an invaluable professional and personal resource for educators who are developing critical educational connections with students (Whiting, 2014).

In chapter 7, *Academically Gifted African American Males: Modeling Achievement in the Historically Black Colleges and Universities and Predominantly White Institutions Context,* Fred Bonner II explores educational paradoxes that challenge the achievements of gifted education for Black males at the P-12 level as well as the postsecondary level. Briefly, Bonner (2014) explicates "standardized testing, teacher nomination procedures, family and peer influences", which frequently present barriers to gifted education for Black males in P-12 (p. 111). Postsecondary relationships with faculty and peers are explored in terms of success and identity; furthermore, the significance of institutional environment whether at a Historically Black Colleges and Universities (HBCU) or Predominantly White institutions (PWI) is discussed as being an important factor for consideration for gifted Black students. Introduced in the chapter is the academically gifted Black male engagement framework (AGBME), which strengthens the chapter because it offers a method to assess the perceptions of gifted Black male experiences at HBCU and PWI's. Lastly, the chapter concludes with concrete instructions and recommendations to address the six AGBME categories, which reinforces the frameworks validity.

In chapter 8, *Gifted, Black, Male, and Poor in Science, Technology, Engineering, and Mathematics*, Alonzo M. Flowers begins by providing the reader with a glimpse into Black male's post-secondary educational experiences in the United States by illuminating a number of disparities, educational inequities, and mistreatment due to racial and socioeconomic status of academically gifted black males in STEM. Flowers demonstrates how three prevailing conceptual models, "Sternberg's triarchic theory of intelligence, Tinto's student integration model, and Whiting's scholar identity model" (p. 127), have been used to gain insight about the academically gifted, poor Black male as he matriculates through Predominately White Institutions (PWIs) and Historically Black Colleges and Universities (HBCU). Finally, he concludes the chapter by offering the reader with four substantial recommendations identified in his research to enhance the success rates for academically gifted Black males in STEM.

In chapter 9, *Theorizing Manhood*, T. Elon Dancy provides the reader with the systematic way in which poor Black boys are (mis)constructed for manhood by an educational system that introduces and reinforces negative stereotypes about them—often perpetuated by dis-interested

predominantly White communities. Dancy highlights how current trends in the research on Black men in the collegiate environment is primarily focused on two areas: "how construction of masculinity influence college gain and the group or fraternity dynamic influencing college manhood and masculinity" (p. 147). The author provides details of a qualitative study involving 12 colleges spread across 19 southern Border States in the U.S. that shows the institutional role of colleges in shaping the construction of Black manhood. Finally, Dancy shares the implications of the study and provides recommendations for reversing academic and social behaviors that conflict with educational achievement.

In chapter 10, *Exploratory Study of the Factors Affecting the Academic and Career Development for African American Males in Science, Technology, Engineering, and Mathematics*, James Moore III, Lamont Flowers, and Lawrence Flowers provide a methodology that can be utilized to investigate the academic experiences of Black Males who major in STEM disciplines and also provides scaffolding to explore the "impact of individual- and institutional-level factors" (p. 161) on Black males in STEM degree programs. The authors examined numerous studies on the impact race had on educational outcomes, and they also interviewed Black men enrolled in STEM programs at an HBCU. The study resulted in five areas within the framework that produced positive results for Black males participating in STEM programs.

In Chapter 11, *The Five Domains: A Conceptual Model of Black Male Success in the Community College*, J. Luke Wood and Frank Harris III mention the influx of Black males in community colleges and how their experiences vary based on varying demographics. The authors indicated that enrollment in community colleges in contrast to four-year institutions required special consideration when addressing persistence, retention, and the success of Black male students. Notwithstanding the fact that Wood and Harris elaborated on their findings related to their five domain conceptual model of Black male success in community college; they suggested that there was a dearth of literature on Black male success in the community college context. Significant to the chapter is the fact that Wood and Harris layout a conceptual model to identify multiple factors within the domains that affect the academic success of Black males who enroll in community colleges.

In chapter 12, *I Can Do More Than Play Ball*, Derrick L. Gragg a former student athlete, presents the reader with an issue that is dear to him personally, the perceived impact collegiate athletics, specifically revenue producing sports, has on the academic performance of Black males in higher education. The author suggests that statistically Black male student athletes' persistence and graduation rates greatly lag behind that of their White male counterparts in revenue generating sports like football and basketball. Gragg identified a number of common themes associated with Black male athletes that positively affected their academic success and graduation. The author also recommends areas of improvement to enhance this understudied population.

In chapter 13, *I Ain't No Punk, A Framework for Black Gay Male Students' Belonging*, Terrell Strayhorn narrated President Obama's commitment to America becoming the leader in the number of college graduates by 2020 (p.200). Strayhorn states that reports estimates vary in terms of what it actually means in terms of numbers to be a leader in producing college graduates. However, he is clear that in order for the nation to realize this goal. We will need to draw on all pools of available talent and strengthen the educational pipeline for all students,

including those who may face the most significant challenges in higher education such as Black men. Strayhorn further posits about the nuances associated with the Black male experience, specifically by talking about the plight of Black gay men.

## Concluding thoughts

*Building on Resilience* provides useful tools to consider by way of introducing critical educational frameworks. This book is indeed a deviation from the deficit storyline often told about Black students, particularly Black male students. One of the most inspiring statements in the book is Rev. Otis Moss' use of metaphor when he refers to those who come into the world who are "kissed by nature's sun" (Black children), need not to be despondent and that their tomorrow should be filled with hope and not despair. If there is to be a second edition of *Building on Resilience*, it would be immensely advantageous to include a case study of gifted Black resilieant males who have achieved success like Rev. Otis Moss III. Moss stated himself that his own experience (in education) was a case study. However, he truly leaves the reader in a place of awe when he asks us to imagine a world where all Black boys are seen as – brilliant—a world in which teachers seek to inspire and illuminate.

## Reference

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## Addeess

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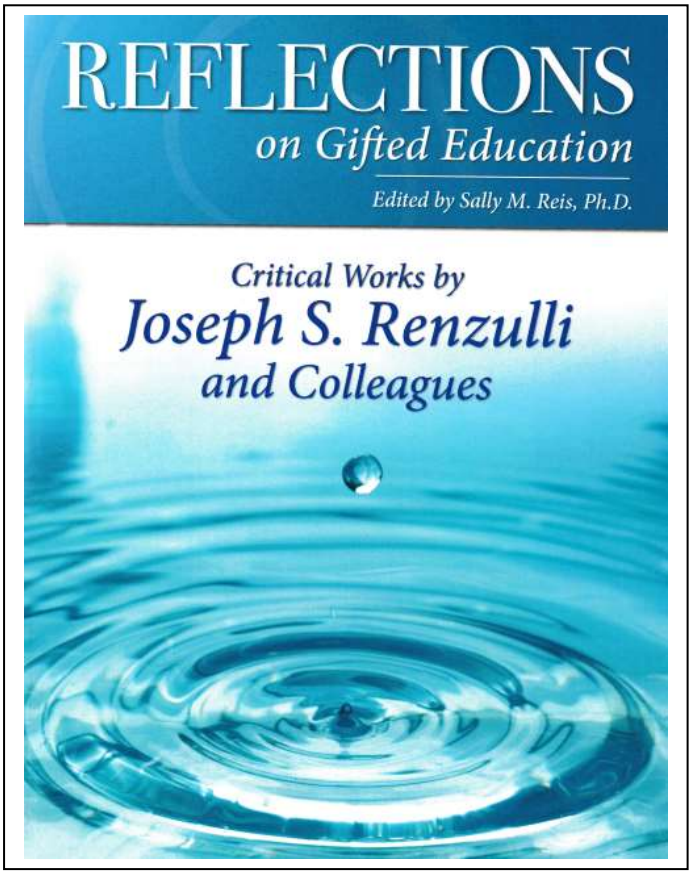
**Book Review (2):**

# Reflections on Gifted Education: Critical Works by Joseph S. Renzulli and Colleagues

**Sally M. Reis (Editor, 2016)**

**Sandra M. Linke**
The International Centre for Innovation in Education (ICIE), Ulm-Germany

> "In our time, when the topic is 'education for the gifted,' the name Joe Renzulli rises to the top—for the breadth of his vision and the depth of his understanding, for his work's foundation in solid research and its utility in the classroom. Going forward, we can all benefit from this splendid collection of his important writings."
>
> **Howard Gardner**




The idea behind this book has been to collect Renzulli's most important ideas in one place. "These ideas have practical value for anyone seeking to implement what can be described as a "brand" of gifted education and talent development that differs from traditional approaches in this field." (p.xii). Joseph Renzulli emphasizes that students should view learning in positive ways. "Enjoyment, engagement, and enthusiasm for learning should be the goals of any special opportunities we provide to students"(p.xii). (p. xii)

In this compelling book, more than 40 years of research and development are highlighted in a collection of articles published by Joseph S. Renzulli and his colleagues. The editor, Dr. Sally Reis, has selected Renzulli's and colleagues' most widely cited articles that have had the most profound and lasting impact on educational program planning that serves diverse student populations both in the United States and around the world. An underlying *Theory of Knowledge* in addition to Renzulli's well-known *Three Ring Conception of Giftedness* and *The Enrichment Triad Model* form the theoretical foundation for practical suggestions that guide program development. Successful practices, examples of time-tested resources, and case studies of exemplary schools are abundantly illustrated throughout the book. A general theme is the need to apply more flexible approaches to identifying and developing giftedness and talents in young people through teaching practices that focus on: (1) *applied* thinking skills; (2) creative productivity; (3) an investigative mindset; and (4) the appropriate use of technology. This collection will provide educational theorists and practitioners with valuable insights into the innovative ways that learning contexts can motivate high potential students from demographically different backgrounds and cultures.

In Chapter 1, "*Examining the Challenges and Caveats of Change in Gifted Education*", Joseph S. Renzulli (2016) summarizes his perspectives on educational innovation and the necessary steps one needs to implement transformative change, particularly in the field of gifted education. In addition, Dr. Renzulli addresses the inevitable criticism that often follows the introduction of new ideas that challenge the status quo in education. This initial chapter sets the stage for the subsequent chapters that follow.

A discussion of some new research in this field of knowledge, as well as the changing policies and practices in both general and gifted education is presented in Chapter 2, "*Reexamining the Role of Gifted Education and Talent Development for the 21st Century: A Four-Part Theoretical Approach*", Renzulli (2016) synthesizes the varied school-based applications of his work. These opportunities always resulted in both reflection and the search for answers to questions about what can be done to improve the services to the teachers and students we serve. Although Renzulli's early work on the *Three-Ring Conception of Giftedness* and the *Enrichment Triad Model* gained more attention than expected, he began to believe that there were still characteristics and programming opportunities that needed to be added to the overall search for factors that contribute to a more holistic perspective of talent development.

The original article on the *Three-Ring Conception of Giftedness* appeared in a 1978 edition of *Phi Delta Kappan*. This article has now become the most widely cited article in our field. Over the years, Joe Renzulli has updated the article to include new research and changes in identification and programming. The most important point in this chapter is the need for differentiated provisions for both high-achieving students and the development of what Joe Renzulli has described as creative productive giftedness.

In Chapter 3, "*The Three-Ring Conception of Giftedness: A Developmental Model for Promoting Creative Productivity*", Joe Renzulli introduces and reprints the most recent update of the most cited work in talent development and giftedness. The most important point in this chapter is the need for differentiated provisions for both high achieving students and the development of what Joe has described as creative/productive giftedness.

In Chapter 4, "*Defensible and Doable: A Practical, Multiple-Criteria Gifted Program Identification System*", Renzulli discusses a number of considerations that must be taken into

account when designing an identification system for a school, district, or even a state. His step-by-step identification system is based on the *Three Ring Conception of Giftedness.* This identification system is designed for programs that focus on creative/productive giftedness, as delineated in the *Enrichment Triad Model*. The identification system does, of course, provide a major pathway for all very high achieving students; moreover, it also "opens the door" for participation by students who show potential for high performance and creative productivity. In the early 1970s when Joe began work on the *Three-Ring Conception of Giftedness*, he embedded the rings in a houndstooth background that represented the interaction between personality and environment. In recent years, further research and theory development in addition to a growing concern in the field related to social and emotional development have led to new dimensions of his work.

In Chapter 5, "*Intelligences Outside the Normal Curve: Co-Cognitive Factors that Contribute to the Creation of Social Capital and Leadership Skills in Young People*", Renzulli discusses how the six co-cognitive factors interact with and enhance cognitive traits that are ordinarily associated with the development of both high achievement and creative/productive manifestations of giftedness. A discussion of social capital is also offered in this chapter. There is a discussion of intangible assets that address the collective needs and problems of other individuals and our communities at large. Investments in social capital can help to create the values, norms, networks, and social trust that facilitate coordination and cooperation geared toward the greater public good.

In Chapter 6, "*Assumptions Underlying the Identification of Gifted and Talented Students*", Scott W. Brown, Joseph S. Renzulli, E. Jean Gubbins, Del Siegle, Wanli Zhang, and Ching-Hui Chen summarize a research study that investigate teachers' perceptions about changes in conceptions of giftedness and the types of information that should be used in the identification process. Strong agreement was found among classroom teachers, gifted education teachers, administrators, and consultants (experts in the field and state directors) from urban, suburban, and rural districts that supported a more liberal conception of giftedness. Overall, respondents also disagreed with a "test-score approach" to the identification of these students. An emphasis on the importance of individual expression, on-going assessment, and context information is highlighted. This study emphasizes the importance of using multiple criteria for the identification of gifted and talented children.

In Chapter 7, "*A Theory of Blended Knowledge for the Development of Creative Productive Giftedness*", Dr. Renzulli sets the stage for a better understanding of the chapters that follow in this section of the book. Early epistemology reflected in the work of classical philosophers find their way into educational templates such as Bloom's *Taxonomy of Educational Objectives*. This epistemological work further reflects Renzulli's growing fascination with the importance that technology is now playing for learners of all ages and the easy accessibility to the wide world of knowledge that young people now have through the Internet. An examination of the three levels of knowledge Joe proposes and the importance of blending them together are addressed in this chapter.

*The Enrichment Triad Model* was developed in the mid 1970's in conjunction with the *Three-Ring Conception of Giftedness.* This model is essentially a learning theory, and was primarily developed to serve as a practical guide for promoting creative/productive giftedness. Both the ETM and the *Three-Ring Conception of Giftedness* were greeted with skepticism by the gifted education community. These theoretical models challenged prevailing trends about the conception of giftedness and the belief that higher level thinking skills were in the exclusive province of gifted students only. Renzulli's models continued to

gain popularity over the years. In Chapter 8, "*The Enrichment Triad Model: A Guide for Developing Defensible Programs for the Gifted and Talente*d", Renzulli introduces an updated version of the original work on Triad and a compilation of the original theory plus various conceptual and practical additions that have been added over the years. This chapter serves as an overview rather than as a practical guide for implementation.

Dr. Renzulli designed the *Multiple Menu Model* as a way to enable teachers and students taking his curriculum development course to develop a high quality curriculum that integrates a variety of instructional and assessment strategies. Joe Renzulli introduces this model in Chapter 9. The part of the *Multiple Menu Model* that has resonated with most curriculum developers and teachers of advanced students is the *Artistic Modification Menu*. This menu invites teachers to embed their own personal interests and experiences related to a selected topic into the curriculum. Most prescribed curriculum does not encourage teacher modifications; in contrast, this approach extends an invitation to teachers to personalize a topic invariably leading to more exciting and engaging experiences for their students.

In Chapter 10, "*The Schoolwide Enrichment Model: A Focus on Student Strengths and Interests*", Sally M. Reis and Joseph S. Renzulli point out that most of the work that they have completed over the last four decades has been devoted to the research and development of the identification practices and teaching strategies for promoting gifted behaviors. Over the years, Reis and Renzulli realized that many students, in addition to those formally identified as gifted, would benefit from school experiences that are more enriching, engaging, and challenging. Sally Reis and Joe Renzulli also realized that in order to encourage transformative changes in school systems overall, we need to pay some attention to an organizational plan or model for the delivery of these strategies. *The Schoolwide Enrichment Model* (SEM) emerged as a result of this growing awareness. The SEM applies the pedagogy of gifted education to the total talent development of all students. A growing number of SEM schools has occurred over the years and this chapter summarizes almost four decades of their work.

In Chapter 11, "*Curriculum Compacting and Achievement Test Scores: What Does the Research Say*?", Sally M. Reis, Karen L. Westberg, Jonna M. Kulikowich, and Jeanne H. Purcell concluded that although the focus of Renzulli's work has been on strategies for the development of creative/productive giftedness, any plan for total talent development must also include a curriculum acceleration component that differentiates curriculum and instruction for traditionally high achieving students. After experimenting with a few approaches, a systematic process for differentiation called "curriculum compacting" is described. Developed and subsequently researched, it is now one of the most widely used and researched forms of differentiation for high achieving and gifted and talented students.

In Chapter 12, "*A Time and a Place for Authentic Learning*", Joseph S. Renzulli, Marcia Gentry, and Sally M. Reis address this interesting topic. In order to provide general enrichment opportunities for all students while simultaneously ensuring that opportunities for more advanced work are available for highly able and motivated students, Joe Renzulli developed a concept in the 1980s called "enrichment clusters". This component of the *Schoolwide Enrichment Model* has become "the growth stock" of our implementation recommendations; and we recommend that schools begin their total talent development programs with this part of their work. Teachers who have conducted successful enrichment clusters learned to use a good deal of gifted education pedagogy and follow up studies

indicated that they were able to integrate many of the strategies used in the cluster to their regular classroom teaching.

As the middle school "movement" began to flourish in the 1980's, several SEM schools implementing enrichment clusters asked about ways of organizing their schools to capitalize on student interests and to use the pedagogy recommended in the Enrichment Triad Model. This interest resulted in a two part series in *The Middle School Journal* and reprinted in this chapter. In Chapter 13, "*Academies of Inquiry and Talent Development*", Joseph S. Renzulli points out the ways in which a middle or high school can offer several theme-based academies within in a single school and how such academies can place a major focus on creative productivity rather than accelerated lesson learning.

One of the challenges we face in promoting the pedagogy that is based on SEM is the almost unreasonable amount of time necessary for teachers to carry out the type of enrichment learning we advocate. In Chapter 14, "*A Technology Based Program that Matches Enrichment Resources with Student Strengths*", Joseph S. Renzulli and Sally M. Reis describe the *Renzulli Learning System* (RLS). This system (developed by Renzulli and Reis) was subsequently sold by UConn to Compass Learning Corporation and is now marketed under the name of *GoQuest. Renzulli Learning System* showed positive results in promoting improvements in student achievement. A qualitative study reported the effectiveness of the RLS as a tool for increasing achievement, engaging quality, and creating independence. Schools that do not have access to *GoQuest* can create profiles using print versions of the strength-based instruments and no cost search engines that are readily available in the Internet.

The *Schoolwide Enrichment Model in Reading* (SEM-R) is an outgrowth of the SEM. It is a reading enrichment approach that has been shown to be effective in increasing elementary and middle school students' reading achievement and attitudes toward reading. The SEM-R provides enriched reading experiences by introducing students to books in their areas of interest. Interest-based literacy choices, differentiated reading instruction, and the encouragement of self-direction in reading are highlighted. The *SEM-R* is introduced in Chapter 15. Dr. Renzulli's work has also influenced many of our colleagues. In Chapter 16, "*Nurturing Young Student Mathematicians*", M. Katherine Gavin and Tutita M. Casa shed light on contributions and achievements made in this context. In addition to the SEM-R, Kathy Gavin worked with a team of colleagues for years to develop mathematics materials for talented students that are based on coherent and rigorous development of advanced concepts. She and her colleagues created a series of units for mathematically promising students in grades K-6 under grants sponsored by the U.S. Department of Education (Javits Grant) and the National Science Foundation. Based on the pedagogy set forth in the *Enrichment Triad Model* and the *Multiple Menu Model*, these materials foster in-depth understanding of advanced mathematical concepts by challenging and motivating students to discuss and solve high-level problems in a fashion similar to practicing mathematicians. They are currently being used to meet the needs of talented elementary students in all 50 states and in several other countries including Singapore and Hong Kong.

A major challenge facing the field of gifted education is the underrepresentation of low income and minority students participating in special programs and services. In Chapter 17, "*The Achievement Gap and the Educational Conspiracy against Low-Income Children*", Joe Renzulli summarizes the work that he completed over the past several years to address the underrepresentation of these students in gifted programs. He provides valuable suggestions for reducing various barriers. This chapter and the one that follows examine both

the reasons for underrepresentation and one approach that has made a significant difference in the lives of high potential/low income students from a major urban area.

In the last decade or so, we have seen a remarkable increase in the number of schools that use the SEM as a schoolwide theme. Some of these schools, named Renzulli Academies, integrate much of the work described in this book. In Chapter 18, "*From High Potential to Gifted Performance: Encouraging Academically Talented Urban Students*", Sally Reis, and Miriam-Morales Taylor provide a case study of an urban school called the Renzulli Academy. This chapter emphasizes the importance of the supportive and commitment of all educational stakeholders if any educational initiative is to have a positive impact on teaching and learning dynamics. The emergence of standards in individual states and the new Common Core State Standards coupled with the almost overpowering influence of standardized testing have had the effect of squeezing highly engaging enrichment activities out of the curriculum. Many teachers have become so accustomed to requirements for "teaching-the-text" and overusing worksheets to grind up standardized test scores that they no longer have the opportunity or, in some cases, the know-how to deviate from prescribed material. In Chapter 19, "*An Infusion-Based Approach To Enriching the Standards-Driven Curriculum*", Joseph S. Renzulli, and Nicole Waicunas present a strategy that teachers can use for achieving a balance between the required curriculum and a way of infusing enrichment activities into standards driven material. Some examples of these exciting ideas developed by teachers are provided. In Chapter 20, "*Reversing Underachievement through Enrichment*", Joseph S. Renzulli, Susan M. Baum, Thomas P. Hébert, and Ken W. McCluskey describe one of the few intervention studies conducted on underachievement, using *Renzulli's Type III Enrichment Model*. The study explores the way that teachers can reduce underachievement among potentially highly talented and gifted individuals. Specifically, the investigation highlights the importance of using a different lens to identify gifts rather than problems and to focus on talent development rather than remediation. Although a great deal has been written about the underachievement dilemma, there has been surprisingly little research upon which to make recommendations about turning around underachievement.

Over the years Joseph S. Renzulli has written a number of short pieces for the Commentary section of *Education Week,* the nation's most widely read education newspaper. Although this publication has a strict policy limiting articles to 1200 words, it is extensively read by education leaders and administrators. The articles can act as a catalyst to encourage advocacy and innovation in program planning for talent development among diverse learners. In Chapter 21, "*Commentary on Contemporary Issues*", Joseph S. Renzulli included four of his favorite commentaries.

What motivates Dr. Joseph Renzulli to continue his quest on educational innovation? In Chapter 22 "*A Biographical Portrait of Joseph S. Renzulli: Scholar, Gifted Educator, and Visionary Leader*", Thomas P. Hébert includes the interviews that reinforce the valued contributions Renzulli has made to education. These interviews also reflect the values, beliefs, intentions, and ideals that have guided Dr. Renzulli in his pursuit of educational innovation pathways.

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# Lost Prizes/ICIE Seminars

## July 6 – 9, 2016

**Kari McCluskey**
The University of Winnipeg

Lost Prizes International (LPI) and the International Centre for Innovation in Education (ICIE) invite you to the 4th Annual Lost Prizes/ICIE Seminars taking place July 6-9, 2016 at The University of Winnipeg, Winnipeg, Manitoba, Canada. Once again we will offer conference-connected Post-Baccalaureate Diploma in Education courses before and after the event. Courses include *Strategies and Models for Higher-Order Thinking and Instructional Improvement, Responsive Teaching in Today's Classroom, Topics in Risk and Resiliency,* and *The Art of Kid Whispering.*

**The Seminars will feature the following keynote addresses:**

### The Impact of 21st-Century Globalization on Creativity, Giftedness, Talent Development, and Education

***Don Ambrose***

As we move further into the 21st century we are confronted with enormous problems and unprecedented opportunities. In a recent international, interdisciplinary project addressing the impact of 21st-century globalization on creative intelligence and education, leading scholars of creativity, giftedness, and general education reacted to an interdisciplinary analysis of globalization and recommended ways that individuals, education systems, and societies can work more effectively in these complex, threatening, exciting conditions. This session offers an overview of the "macroproblems" and "macro-opportunities" generated by 21st-century globalization while considering the possibility that the macroproblems could precipitate a massive collapse of civilization some time in the next few decades, as well as the possibility that the macro-opportunities might lead to unprecedented success and fulfillment for billions around the globe. Discussion will also take place concerning the ways in which gifted education and general education can adapt to strengthen the likelihood that more than just a fortunate few will survive and thrive in the decades to come.

**Don Ambrose** is Professor of Graduate Education at Rider University in Lawrenceville, New Jersey, and Editor of the *Roeper Review*. He serves on the editorial boards of most of the major journals in the field of gifted education and for several book series. Don has delivered keynote presentations throughout much of the world, and initiated and led numerous interdisciplinary scholarly projects involving eminent researchers and theorists from gifted education, general education, creative studies, cognitive science, and

several other fields. Some of his recent books include *Giftedness and Talent in the 21st Century: Adapting to the Turbulence of Globalization* (Sense, with Robert J. Sternberg); *Confronting Dogmatism in Gifted Education* (Routledge, with Sternberg and Bharath Sriraman); *Morality, Ethics, and Gifted Minds* (Springer Science, with Tracy L. Cross); and *A Critique of Creativity and Complexity: Deconstructing Clichés* (Sense, with Sriraman and Kathleen M. Pierce). Projects currently in press and under construction include a book of new teaching strategies based on constructs derived from various academic disciplines.


## Supporting the Inherent Quality of Resilience

***Mark Freado***

The ability to persevere through adversity or recover from setbacks is in all of us. Resilience is a natural characteristic in all people. The responsiveness and strength of resilience in individuals is affected by our nature and the ecology in which we live. Much of our work is focused on serving young people and families whose personal strengths may be severely challenged by the absence of environmental protective factors. With attention to vital sign needs and effective intervention strategies, participants in this keynote will be introduced to and guided through approaches that effectively support and energize the inherent quality of resilience in those we serve.

**Mark Freado**, a forensic psychologist and Past President of Reclaiming Youth International, now serves as a Director and Consultant for Cal Farley Learning. His 35-year professional career encompasses contributions to the mental health field, public education, social services, program development, leadership, consultation, and training. Mark has worked with private providers and public agencies throughout North America, Europe, and Australia delivering consulting and training services. He is a frequent practitioner of the

Developmental Audit, providing evaluations, reports, and expert testimony on behalf of youth in the juvenile or adult judicial systems. Mark specializes in program assessment, development, and adaptation; leadership skills training and consultation; and interventions for at-risk and disadvantaged children, adolescents, and their families. His recent book, written with J. C. Chambers, is entitled *The Art of Kid Whispering: Reaching the Inside Kid*.

## High Ability and Vulnerability

### *Trevor J. Tebbs*

This keynote examines the "why, what, and how" of *vulnerability* in the context of *high ability*. Understanding the relationship between the two concepts is essential. Failure or underachievement in some way and for whatever reason should not *automatically dis-qualify* an otherwise *qualified* individual from being recognized and consequently provided with every possible support in order for him or her to realize full potential. Over the years, concern has greatly increased upon hearing the phrase, or observing body-language that essentially says, *"He/she can't be gifted because ..."* Such preconceptions are held even by professionals who might be expected to know better. This must change. It only takes one *mindless* interaction to switch an individual's developmental potential from positive to negative. In this context, the session will also explore three dimensions of the nature and relevance of *holistic* assessment: (a) as it pertains to high ability, (b) how it reveals specific conditions to which an individual may prove vulnerable, and (c) how discovery of these issues may lead to a more closely aligned *mindful* approach to both the pedagogical and social-emotional needs of the individual.

**Trevor Tebbs** is a veteran educator with more than 45 years of experience that began in the United Kingdom. Trained and certified to teach K-12 in the UK, he has worked in regular and special education settings and been a vice principal in a school dedicated to children with special needs. After a period of research in the USA, Trevor became an Adjunct Professor in the art department of a local college. His professional focus then shifted towards the population of high-ability children and their educational and social-emotional needs. Trevor worked with Joe Renzulli and his team at the National Research Center on the Gifted and Talented at the University of Connecticut, where he served as Associate Director of the Honors Program. During the last decade, Trevor has built a private practice working with individuals of all ages who don't quite fit the accepted mold and usually present highly complex academic and social-emotional problems. He recently completed his term as Assistant Editor of the World Council for Gifted and Talented Children's journal, *Gifted and Talented International*, and is currently an Associate Editor of the *International Journal for Talent Development and Creativity*.

## School Life that Matters

### *Steve Van Bockern*

Many adults in school settings want to refocus their energy and efforts in ways that matter to them and their students. The race to the top of the academic mountain has done little to help our children feel competent. Instead of seeing students as data points to be measured and sorted, schools should focus on the total well-being of the child *and* the adults who teach and care for children. The "School Life that Matters" approach uses the Circle of Courage (see *Reclaiming Youth at Risk: Our Hope for the Future* by Brendtro, Brokenleg, and Van Bockern) as the roadmap for building places where children and adults experience belonging, mastery, independence, and generosity.

**Steve Van Bockern** is Professor of Education and Special Education at Augustana University, Sioux Falls, South Dakota and Past Dean of Reclaiming Youth International. Drawing on experience as a public school principal and teacher at the elementary and secondary levels, he consults with numerous schools and alternative education programs throughout North America. Steve has directed grants for the National Science Foundation and the Kellogg Foundation and has developed programs for talented students. He has also served as Co-Director of the Black Hills Seminars, and is a former senior trainer for the Life Space Crisis Intervention Institute of Hagerstown, Maryland and a featured presenter for Cal Farley Learning. In 1990, Steve and his colleagues, Larry Brendtro and Martin Brokenleg, wrote *Reclaiming Youth At Risk: Our Hope for the Future*, a best-selling text that has had a worldwide impact on educators working with marginalized young people.

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**For more information**, or if you are interested in joining us, please contact Kari McCluskey, Coordinator of *Lost Prizes*, at **e-Mail:** ka.mccluskey@uwinnipeg.ca.

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