



International Journal for Talent Development and Creativity

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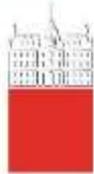


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Table of Contents

From the Founders:

-  *Networking Par Excellence for Excellence.*
Taisir Subhi Yamin; Ken W. McCluskey 7

From the Editor's Desk:

-  *Insight and Imagination: Ventures into Creativity and Talent Development.*
Karen Magro 9

Articles:

-  *The Role of Blended Knowledge in the Development of Creative Productive Giftedness.*
Joseph S. Renzulli 13
-  *Specific Learning and Teaching Strategies That Work, and Why They Do So.*
Roald Hoffmann; Saundra Y. McGuire 25
-  *A Phenomenographic Study of Talented, Low-income Undergraduate Students.*
Pam Millward; Janna Wardman; Christine Rubie-Davies 39
-  *The Strengths, Needs and Vulnerabilities of Gifted Employees.*
Carla Vreys; Kathleen Venderickx; Tessa Kieboom 51
-  *Effects of the Dunn and Dunn Learning Styles Model on Reading Comprehension and Motivation: A Case Study in Innovative Learning.*
Ahmad Oweini; Carma Daouk 63
-  *What Do You Think? Seeking Out the Voices of Responsible Iconoclasts in our Schools.*
Kenneth L. Reimer 71
-  *What if Musical Skill, Talent, and Creativity were just a Matter of Memory Organization and Strategies?*
Véronique Draï-Zerbib 87
-  *A Conative Approach to Creativity: The Correlation Surface of Psychopathology and Ego-strength*
Christiane Kirsch; Claude Houssemand 97
-  *Tension in Chemistry and Its Contents.*
Roald Hoffmann 109
-  *Rebuilding, Healing and Transforming: Innovative Approaches and Promising Strategies for Children Affected by War.*
Jan Stewart; Jody Lynn McBrien; Betty Ezati 121

 *Ferguson, Florida, and Fruitvale: A Requiem for Black Males in the Key of F-Minor.*
Fred A. Bonner II **137**

 *Reexamining the Role of Gifted Education and Talent Development for the 21st Century:
A Four-Part Theoretical Approach.*
Joseph S. Renzulli **141**

 *An Innovative Resilient Strategy towards Creatively Teaching Mathematics.*
Ioannis Kougias; Lambrini Seremeti; Dimitris Kalogeras **155**

 *Character and Expression of a Musical Piece in Foreign Language Teaching to Children.*
Karolina Jarosz **165**

Profiles of Creativity:

 *Successes and Failures in a Sixty-Year Career Trying to Understand Human Intelligence.*
Robert J. Sternberg **175**

Profiles of Giftedness:

 *Rena F. Subotnik.*
Taisir Subhi Yamin **183**

Book Reviews:

 *Our Kids: The American Dream in Crisis.*
Stephen Hornstein; John Hoover **189**

 *Life Expects: Educating Students to Lead Fulfilling Lives.*
Sandra M. Linke **193**

 *Out of Sync: Essays on Giftedness.*
Dorothy A. Sisk **197**

Conference Highlights:

 *The 13th International Conference on: Excellence, Innovation & Creativity in
Basic-Higher Education & Psychology, Rijeka, Croatia (May 18-21, 2016).*
Alan C. Wiebe **205**

Submission Guidelines

From the Founders:

Networking Par Excellence for Excellence

Taisir Subhi Yamin; Ken W. McCluskey

For *Lost Prizes International* (LPI) at the University of Winnipeg (UW) and the International Centre for Innovation in Education (ICIE), 2016 has been a year highlighted by some very significant networking initiatives. Most notably, ICIE's 13th International Conference (on Excellence in Education and Psychology), held May 18-21 in Rijeka, Croatia, was a resounding success – the Conference and vibrant Youth Summit together attracted 450 participants representing 73 countries.

Day One of this ICIE event featured a large number of distinguished keynote speakers presenting on a variety of intriguing and informative topics: Todd Lubart (Université Paris Descartes, France) - *Robust Measures of Creative Potential in Children, Adolescents, and Adults*; Pero Lucin (University of Rijeka, Croatia) - *A New World of Learning*; Ken McCluskey (University of Winnipeg, Canada) - *ADHD: Disorder or Gift?*; Joe Renzulli (University of Connecticut, USA) - *Schools for Talent Development: A Comprehensive Plan for Program Planning and Implementation*; and Sally Reis (University of Connecticut, USA) - *The Underachieving Dilemma and Gifted Women and Girls*.

And throughout the following days of the Conference, there were several other keynote addresses as well: Anies Al-Hroub (American University of Beirut, Lebanon) - *Psychometric Versus Dynamic Assessment for the Identification of Twice Exceptional Learners*; Jacques Grégoire (Catholic University of Louvain, Belgium) - *Shaping our Future in Developing Creativity in Scientific Research*; Uwe Hameyer (Kiel University, Germany) - *How Schools Learn – Inside the Secrets of Success*; Boris Jokić (Institute for Social Research, Zagreb, Croatia) - *Educational Change in Croatia: Mantra, Illusion, or Reality*; Mojca Jurisevic

(University of Ljubljana, Slovenia) - *Motivational Portraits of the Gifted: Psychology, Development, and Teaching*; Svjetlana Kolic-Vehovec (University of Rijeka, Croatia) - *Combination for Success: Metacognition and Motivation*; Kristof Kovaks (Eszterhazy Karoly College, Hungary) - *A Process Overlap Theory of the Positive Manifold in Intelligence*; Jasminka Ledic (University of Rijeka, Croatia) - *Does the Academia Foster Excellence?*; Heinz Neber (University of Munich, Germany) - *Problem-Based Learning – A Framework to Transform Students into Problem Generators*; Roland Persson (Jonkoping University, Sweden) - *Heroes to the Rescue: The Social-Evolutionary Boundaries for Benign Gifted Intervention in the Envisioned Future of Society Prosperity*; Ugur Sak (Anadolu University, Turkey) - *Unpredictable Development of Giftedness through Multipliers*; and Alan Wiebe (University of Winnipeg, Canada) - *What are the Key Elements Inherent in a Successful Mentorship Program?*

Also, there were two major sessions delivered via compelling video interview format: Don Ambrose (Rider University, USA) - *Creative Intelligence in the 21st Century: Grappling with Enormous Problems and Huge Opportunities*; and the Nobel Laureate Roald Hoffman (Cornell

University, USA) - *My Life Journey: Creativity, Innovation, and Excellence in Science and Education*.

Shortly thereafter, on the other side of the Atlantic, the 4th Annual *Lost Prizes/ICIE* Seminars were held July 6-9 at the University of Winnipeg. With 200 participants, the venues were filled to capacity, and there were more than 400 registrants for the accompanying conference-connected courses (which took place immediately before and after the event). Courses included 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 featured, among others, the following keynote addresses: Don Ambrose (Rider University, NJ) - *The Impact of 21st-Century Globalization on Creativity, Giftedness, Talent Development, and Education*; Mark Freado (Cal Farley Learning, TX) - *Supporting the Inherent Quality of Resilience*; Trevor Tebbs (Castleton University, VT) - *High Ability and Vulnerability*; and Steve Van Bockern (Augustana University, SD) - *School Life that Matters*. As usual, *Lost Prizes International* recognized talented students, creative educators, and exemplary programs (through Scholarship, Publication, and Innovative Program Awards), and UW Access Awards were presented to pre-service educators for their scholarship and community service.

The International Centre for Innovation in Education has also been active on the publication front, with two new books in the final stage of production: *Innovation Education* (edited by Taisir Subhi Yamin, Ken McCluskey, Todd Lubart, Don Ambrose, Kari McCluskey, and Sandra Linke) and *Expanding Voice and Vision in*

Literacy Education (by Karen Magro). And at the University of Winnipeg, UW Faculty of Education Publishing has just released its first book, *Lost Prizes: Identifying and Developing the Talents of Marginalized Populations* (by Ken McCluskey, Don Treffinger, Phil Baker, and Alan Wiebe). Another text, *Schools that Matter* (by Steve Van Bockern), is next in the cue and should be released early in the coming year.

We'll close by providing a brief update concerning this *International Journal for Talent Development and Creativity*. We were pleased this year with the reaction to our first special issue, published last December, 2015 (Volume 3, Number 2). Don Ambrose wrote an informative and provocative target paper, "Innovative Pathways and Possibilities: A Vision for Creative and Transformative Education," in which he argued convincingly in favour of more interdisciplinarity in gifted education. The paper, as intended, generated intriguing responses from many eminent educators and researchers in the area, and sparked what we feel will be valuable dialogue and collaboration among scholars from various disciplines

It is no easy job to produce a journal year after year. Indeed, we suspect it may be one of the most arduous tasks in the world of academe. Accordingly, together ICIE and LPI are increasing the support provided for IJTDC. We're grateful that Karen Magro has agreed to stay on for another term, and now she'll have some additional help. Specifically, beginning with this issue, Karen and Gord Beveridge will serve as Co-Editors-in-Chief. And four of our newer faculty members in Education at UW – Jeannie Kerr, Lloyd Kornelsen, Marc Kuly, and Mike Lukey – will come on board as part of the UW Reviewers team. The hope is, of course, that this increase in person power will allow us to spread the workload a bit, make it easier to meet deadlines, and produce an even higher quality product.

From the Editor's Desk:

Insight and Imagination: Ventures into Creativity and Talent Development

Karen Magro

The University of Winnipeg, Canada

Our current edition of the IJTDC continues to provide new insights in exploring dimensions of creativity, talent, and giftedness across the disciplines and in varied educational contexts. A common thread that unites these articles is human capacity building in a time of peril and hope. In this issue, Joseph Renzulli writes that the advancement of understanding occurs when different types of knowledge work together to enhance learning and wisdom. The main goal of creative endeavors in the arts, sciences, and technology is to make a positive difference in our world. Advanced levels of problem solving and the application of new knowledge require curiosity, self-direction, creativity, and a commitment to completing tasks. Dr. Renzulli's concluding article presents further insights into the role of gifted education and talent development for the 21st century.

Roald Hoffman highlights the way tension, disorientation, and stress can be catalysts for critical thinking and creativity. His article provides examples of innovation and discovery in theoretical and organic chemistry while simultaneously looking at geopolitical and cultural events. Hoffman's discussion of the ethical dimensions of research is particularly relevant in today's competitive academic climate. Carla Vreys, Kathleen Venderickx, and Tessa Kieboom emphasize that the workplace climate can either work to enhance or hinder creativity and giftedness among employees. Creative and gifted employees have many strengths; however, they are also vulnerable to feeling alienated and misunderstood. Their study examines the experiences of gifted and creative adult workers who work in contexts that do not encourage imagination, self-direction, and risk taking. Christiane Kirsch and Claude Housseman examine dimensions of mental health and personality (e.g., openness to new experience, reflectiveness, extraversion, conscientiousness) and creative potential.

A number of the articles consider the dimensions of teaching specific content domains in the classroom setting. Ioannis Kougias, Lambrini Seremeti, and Dimitris Kalogeras explore learning strategies in mathematics that can build resilience and mathematical self-efficacy. Ahmad Oweini and Carma Daouk present a case study of a grade four student while considering the importance of connecting teaching and learning strategies to learning style preferences. Véronique Drai-Zerbib explores the way musical skill and talent can be enhanced by attending more closely to specific information processing models that highlight encoding and retrieval practices. The phenomenographic study presented by Pam Millward, Janna Wardman, and Christine Rubie-Davies explores the experiences of talented low-income undergraduate students in New Zealand. Despite situational and institutional barriers, these students demonstrate specific resilient personality traits such as optimism, perseverance, and curiosity. These students viewed the academic context as a challenge and opportunity to develop their skills. The students' "growth mindset" and intrinsic motivation to succeed and create a positive future for themselves enabled them to overcome numerous emotional and social obstacles. This article has important implications for nurturing

resilience and self-direction among our students at all levels and from culturally and linguistically diverse backgrounds.

Roald Hoffman and Sandra Y. McGuire identify practical teaching and learning strategies that can enhance creativity and motivation among students in higher education. They ground their insights on advances in cognitive psychology, the scholarship of teaching and learning, and practitioners' experienced knowledge. Understanding the processes of learning from the learners' point of view, critical discourse, experiential learning technique, and instructor self-awareness are central to creating a climate where meaningful learning can occur. The instructors' expertise, empathy, and enthusiasm play a key role in helping students learn. The ideas presented by Hoffman and McGuire are consistent with transformative approaches to teaching and learning where a paradigm shift or perspective transformation can occur when instructors make an effort to understand a student's background and prior knowledge. Effective instructors also create "disorienting dilemmas" through case studies, essential questions, quotes, experiments, demonstrations, or narratives that do not challenge the learners' background knowledge and expectations (Brookfield, 2006; Merriam and Grace, 2011; Mezirow and associates, 1990). Students are compelled to explore alternative paradigms and systems of knowledge to broaden their understanding. The emphasis on authenticity, spirituality, and transcultural learning can enrich learning across content areas. In reflecting on varied theories of learning, Sharon Merriam (2008) insists that instructors be continuous learners themselves, expanding their repertoire of teaching to integrate creative and artistic modes of inquiry. "Non-Western and indigenous knowledge systems have always turned to stories, folklore, myths, symbols, music, dance, and even dreams as sources of knowledge"(p.98). Edward Taylor (2008) emphasizes that instructors need to become more aware of the values, beliefs, and ideals that shape their particular teaching style, and that deeper level and transformative learning is far more than "implementing" specific strategies. He asks: "Am I willing to transform in the process of helping my students transform? This means taking the position that without a deeper development and awareness of our own frames of reference and how they shape practice, there is little likelihood that we can foster change in others"(p.13).

This issue of the IJTDC also reminds the reader that we live in a world where social justice, human rights, and equity shape the educational enterprise. Fred A. Bonner II emphasizes the need for educators to be more aware of the way power, privilege, and exclusion work to reinforce barriers and harmful stereotypes. Discussions about racism and discrimination become fragmented and trivialized if open and honest dialogue becomes subverted by media manipulation and collective social denial. The book review of *Our Kids: The American Dream in Crisis* by Stephen Hornstein and John Hoover presents a valuable insight into the way psychological, situational, and institutional barriers prevent children from healthy development—emotionally, socially, and academically. The social fabric that unites communities is fraying and social inequity results in individuals pursuing very divergent pathways in life. Poverty and the divide between "have and have not" communities in America continue to increase. "Distress" comes from disruptive neighborhoods, underfunded schools, parents working at multiple jobs, and a lack of resources that help children with specialized learning needs. A "spirit of generosity" is needed, note Hornstein and Hoover, to transform neighborhoods and communities so that all children can succeed. They present helpful suggestions on ways that these barriers can be removed. Jan Stewart and her colleagues address the way war and conflict impact the psychosocial development and educational trajectories of children. In a post-war context, rebuilding after war is a massive effort and a coordinated multi-faceted systems approach is needed that can provide long-term

assistance and support for children and families. The process of healing is physical, psychological, and social, and education plays an instrumental role in facilitating these processes. Teachers working with vulnerable children and youth need the appropriate training and resources. Their work has important implications for teaching vulnerable children and youth worldwide.

Robert Sternberg presents an autobiographical account of the events and experiences in his life that motivated him to study intelligence. His article is inspirational and leaves the reader motivated to explore new dimensions of creativity and problem solving. “How people conceive of intelligence can vary from time to time and from place to place.” Practical, analytical, and emotional dimensions of intelligence are needed to adapt to everyday challenges and new situations. A shift away from standardized knowledge of content and mastery of routine skills in favour of emphasizing flexibility, risk taking, creativity, and problem solving and the integration of smart technologies can expand networks of communication, notes Pasi Sahlberg (2015). He asserts that “changes in global culture also deeply affect educational policies, practices, and institutions” and that as a result of the international “benchmarking” of educational systems, unique features of different educational systems are highlighted (p.140). One challenge remains certain: within the cultural paradox of globalization, the cultivation of compassion and wisdom throughout the educational spectrum is needed as we try to create communities of peace and sustainability.

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The Role of Blended Knowledge in the Development of Creative Productive Giftedness

Joseph S. Renzulli

The University of Connecticut, USA

Knowledge has no value except for that which can be gained from its application toward some worthy end.

Napoleon Hill

Our history and culture can be charted to a large extent by the creative contributions of the world's most gifted and talented individuals. What causes some people to use their intellectual, motivational, and creative assets in such a way that it leads to outstanding manifestations of creative productivity, while others with similar or perhaps even greater assets fail to achieve at expected levels of accomplishment? The sheer amount of folk wisdom, portrayals in popular media, and biographical and anecdotal accounts about creativity and giftedness are nothing short of mindboggling. Some clarity, however, can be found by carefully examining the creativity literature.

Creativity researchers, for instance, tend to agree that creativity is the combination of originality and task appropriateness as defined in a particular context (Plucker, Beghetto, & Dow, 2004). Moreover, researchers have differentiated among different levels of creativity, ranging from the more subjective (mini-c) to the everyday (little-c) experiences of creativity to professional (Pro-c) and finally, eminent (Big-C) levels of creativity (Beghetto & Kaufman, 2007; Kaufman & Beghetto, 2009). Along these same lines, creativity researchers have also argued that although creativity can be experienced across multiple domains at lower levels of performance, high levels of creative production tend to be domain specific (Kaufman, Beghetto, Baer, & Ivcevic, 2010).

Keywords: Giftedness; creativity; research; productive giftedness; blended knowledge.

Even with these insights from creativity research, we are still unable to answer the fundamental question of how and why some individuals develop their talents and perform at superior levels in analytic, investigative, and creative ways. While it would be tempting to present a yet another "combination-of-ingredients theory" (based on the characteristics of giftedness) to explain why some people achieve at high levels, the theory described in detail in this article addresses how three interrelated levels of knowledge fit into the structure and quality of one's formal learning experiences. These levels are Received Knowledge, Analyzed Knowledge, and Applied and Created Knowledge.

The theory is based on the role that knowledge plays in developing an investigative mindset and creative productivity, and how the integrated use of three levels of knowledge contributes to a major goal of gifted education, which is to increase the world's reservoir of creative and productive individuals. This work is purposefully different from theories about the characteristics of giftedness because it deals with the organization and structure of knowledge and it has implications for both curriculum development and teaching strategies that can be implemented in programs for gifted and talented students. These services represent a central focus of the literature in our field and what we actually do in programs that serve gifted students.

The field of gifted education is replete with systems and models for identification, curriculum development, program development, and program evaluation (VanTassel-Baska & Brown, 2007;

Renzulli, Gubbins, McMillen, Eckert, & Little, 2009; Hunsaker, 2012; Dai & Chen, 2014)) but little attention has been given to an underlying theory that focuses on the role of knowledge in the development of characteristics that bring high potential students to our attention. Just as flour, water, salt, and yeast are the main ingredients for making bread, so also are knowledge and the creative construction and application of knowledge the main “ingredients” for developing highly creative and productive bright young minds.

Epistemology

Theories of knowledge are the focus of the study of epistemology, that branch of philosophy that investigates the origin, nature, methods, construction, and diffusion of human knowledge. In the Western world, epistemology had its origin in the work of Plato and Aristotle, as explained in this elegant quotation.

For Plato, sense data were at best a distraction from knowledge, which was the province of unaided reason. For Aristotle, knowledge consisted of generalizations, but these were derived in the first instance from information gathered from the outside world. These two models of human thinking, termed rationalism and empiricism, respectively, formed the major intellectual legacy of the West down to Descartes and Bacon, who represented, in the seventeenth century, the twin poles of epistemology (Berman, 1981, p. 46).

Bacon’s approach to knowledge and learning became the standard for the development of the scientific method and for all subsequent taxonomic systems for organizing knowledge such as *Bloom’s Taxonomy of Educational Objectives, Book 1: Cognitive Domain* (Bloom, 1954; Anderson & Krathwohl, 2001). Bacon’s taxonomic scheme set forth the paradigm for what has become the major guide for the pursuit of intellectual knowledge.

Bacon’s theory states that knowledge comes primarily from sensory experience and evidence, especially through experimentation guided by six steps: (1) state the problem; (2) gather information/research; (3) formulate a hypothesis; (4) do the experiment; (5) analyze results; and (6) draw conclusions (Machlup, 1980; Rich, 1981). Thus, Bacon’s ideas on what has now become universally recognized as the scientific method have had serious implications for the basic ingredients of what we should be examining as an epistemological framework for developing giftedness in young people (Dick, H. G., 1955).

An interesting historical footnote about the theory discussed here is that the Ancient Greeks mentioned above never believed that certain types of knowledge were more useful than others! Rather, they argued that the advancement of understanding occurred when different types of knowledge worked together to enhance learning and wisdom. The advent of formal curriculum that emerged over the centuries resulted in content and process being treated as separate pedagogical entities by subsequent education theorists. And when testing for content acquisition became the major criterion for measuring school success we moved away from the original concept of blended knowledge embodied in the Aristotelian and Platonic concepts of knowledge (Fitch, 1981). In a certain sense, the theory presented in this article serves as “connective tissue” between the ways in which the ancients viewed knowledge and the changes that have taken place in formal education. These changes have resulted in a clear dichotomy that has forced a distinction in learning theories among the three levels of knowledge around which the theory is structured. Modern day theorists in cognition and instruction (e.g., Brandsford, 2000; Bereiter, 2002) have pointed to the changes that have taken place in learning theory as a result of the advent of the “knowledge age;” and this is the reason that a brief consideration of the *sources* of knowledge as well as the levels of knowledge have been integrated into account in the rationale of this theory.

The theory presented here simply intends to portray the ways that different kinds of knowledge interact with one another to produce the “blended knowledge” at the center of Figure 1. Learners receive information, but as they begin to analyze this information they may find it necessary

to “go back” and gather more material to carry out an analysis. Similarly, when they reach the applied and creative stage, they may also need to return to the received and applied levels; and “return trips” to these levels are usually based on just-in-time rather than presented information. And in those cases when new knowledge, innovative contributions to a field, or even new ways of analyzing data (Big-C contributions) are made at the applied and creative level, the innovative person may be contributing content that becomes part of received knowledge. Although this process is the natural way that learning takes place, an overly standardized test-prep curriculum may severely emphasize received knowledge and in a certain sense “discriminate” against both the analyzed and applied/creative levels of learning. It is for this reason that the theory has relevance to the pedagogy advocated in special programs and the ways in which we train teachers to work with gifted students. The reason that gifted education advocates were among the educators who early on latched on to Bloom’s theory of cognitive development was that it called attention to the higher mental processes important to high levels of development.

Bloom’s work, however, has usually been interpreted as a lineal sequence to the pursuit of higher levels of thinking (not necessarily his intention). The Theory of Blended Knowledge presented in this article views knowledge acquisition and usage as an interactive and cyclical process and thus is presented in the form of a Venn diagram in an effort to portray this interaction (see Figure 1).

Before describing the Theory of Blended Knowledge that is the focus of this article, it is important first to discuss two related issues that are part of the rationale underlying this theory. These issues are important because the production and diffusion of knowledge is central to the advancement of our civilization and an important part of the rationale for establishing and supporting programs for young people with exceptionally high potential.

The purpose of gifted education

The first issue is the justification for providing special services to the targeted group of young people served in special programs for the gifted. “Why,” many people have asked, “should a school, state, or nation provide supplementary funds, specially trained teachers and teacher training programs, conferences, professional journals, and other resources for a group of students that are already endowed with superior potentials?” Although we often respond to this question by talking about the “needs” of these students that are sometimes met but more often not addressed, it seems apparent to state that all students in our schools have needs that should be respected and accommodated. Or we run down a list of our usual maxims (e.g., the need for creative thinking, critical thinking, problem solving, decision making, etc.), but leaders of a recent report entitled *21st Century Skills, Education & Competitiveness: A Resource and Policy Guide* (2008) have argued emphatically that:

Public education has traditionally thought of higher level thinking as the purview of talented and gifted programs, while the teaching of basic skills was geared toward those on a trade track in high schools. Now, the focus must be on making sure all students have a broad array of these skills in addition to strong grounding in core subjects (p. 27).

When asked the question addressed above about why we need special services for gifted and talented students, I have always stated unequivocally that the purpose of providing supplementary resources for the development of giftedness is to increase the world’s reservoir of highly creative and productive individuals. Simply explained, we need more scientist, artists, writers, statesmen, political leaders, entrepreneurs, and designers in all fields of human endeavor who will address the problems of our modern society, improve the health, economy, quality of life, human freedoms, aesthetics, arts, and preservation of the Earth’s resources. While this response may sound abstract and idealistic, it bears a direct relationship to the kinds of contributions that we admire in such gifted individuals as Jonas Salk, Ludwig Beethoven, Margaret Sanger, Pablo Picasso, Martin Luther King, Rachel Carson, Steve Jobs, Marion Anderson, and others who have left their stamp on making the world a better place.

Blending Three *Levels* of Knowledge To Promote Thinking Skills and Creativity

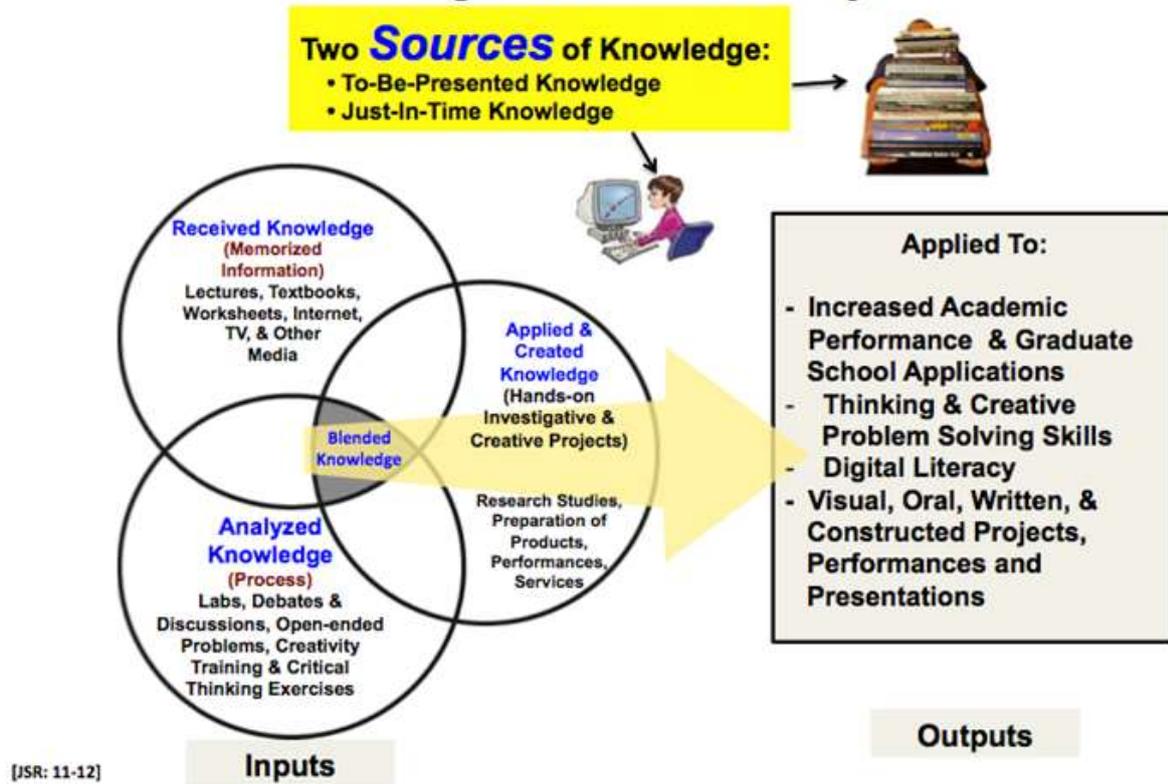


Figure 1: A theory of blended knowledge.

Sources of information and knowledge

The second issue related to this theory has to do with the *sources* of information and knowledge for learners of all ages. Who and what are the providers of information and knowledge in formal learning situations? When it comes to schooling there are essentially two major sources of knowledge. I define the first source as To-Be-Presented (T-B-P) knowledge, the type usually transmitted to students through lectures, textbooks, and other forms of print, visual or auditory media. Committees that develop curricular standards and textbook writers almost universally determine what T-B-P knowledge is used in today's schools, and it is also highly influenced by persons who develop standardized tests. Most traditional learning is based on this source of knowledge.

I call the second source of knowledge Just-In-Time (J-I-T) Knowledge. This type of knowledge is described as the one that people only "go and get" because it is necessary to address a particular problem or to learn more about something assigned or that is of personal interest to the individual. The advent of technology and the Internet has now made access to J-I-T Knowledge ubiquitous to most teachers and students. Technology has also provided us with software that can personalize learning in a way never before available; and it can personalize learning beyond merely modifying the amount and level of content provided to students. Program such as Study Island [<http://www.studyisland.com>], Compass Learning [<https://compasslearning.com>], Naviance [<http://www.naviance.com>], and a program called Renzulli Learning System (RLS) [<http://www.renzullilearning.com>] developed at the University of Connecticut (Field, 2009; Renzulli & Reis, 2007). The Renzulli Learning System creates an individual profile for each student based on his or her interests, learning styles, and preferred modes of expressions; and a unique search engine matches each profile to high engagement resources according to the ways students have responded to the questionnaire that generates the profile. Teachers can also use this software to review, select, and

infuse high engagement enrichment activities into selected curricular topics or units of study being pursued by individuals, small groups, or entire classrooms. True personalization of learning is now possible through the use of today's technology; and teachers now have at their disposal the tools that allow them to blend together the three types of knowledge described below.

Adults in most practical, work related, and problem solving situations use J-I-T Knowledge routinely and the advent of easy-to-use digital age technology has now made J-I-T Knowledge readily assessable to most school age learners. For example, a middle school student investigating the reasons for the collapse of a large building used National Weather Bureau data to obtain the snow accumulations and temperature records for his region of the country over a 50-year period. He also obtained building code regulations and hypothesized that weight-bearing regulations written decades earlier were insufficient to accommodate present day large roof building designs. Imagine how dreadfully boring and irrelevant it would be if all students were required to learn or even memorize 50 years of weather data? The student conducting this study, however, needed the information and therefore it became instantaneously relevant.

Today's students are growing up in a world where their access to and familiarity with mobile devices provides them with instant entrée to the wider world of knowledge. The Center for Applied Special Technology (1996) has gathered compelling research and evaluation findings about the influences that technology is having on achievement, higher order thinking skills, and workforce preparation, and the CEO Forum (2001) has argued that technology has had a significant impact on all areas of the curriculum. The warp-speed technological changes taking place in schools today have become one of the most pervasive occurrences having a significant impact on the education system, so much so that technology is actually influencing learning theory itself. Consequently, technology has provided the necessary impetus to reassess more traditional methods and techniques that we use to bring knowledge into the classroom and guide students in its use.

The content and methodology of a discipline

Received Knowledge (Content) and Analyzed Knowledge (Process) form the basis of all disciplines and their role and interaction have been widely discussed by learning and curriculum theorists. (Phenix 1964) recommends that a focus on representative concepts and ideas is the best way to capture the essence of a discipline. Representative ideas or concepts consist of themes, patterns, main features, sequences, organizing principles and structures, and the logic that defines a discipline and distinguish it from other disciplines. Representative ideas and concepts can also be used as the bases for interdisciplinary or multidisciplinary studies. When we select content, the level of advancement or complexity of material we must first and foremost take into consideration the age and ability, maturity, previous study, and experiential background of the students. Beyond these considerations, three principles of content selection are recommended. (1) Curricular material should escalate along a hierarchy of the following dimensions of knowledge: facts, conventions, trends and sequences, classifications and categories, criteria, principles and generalizations, and theories and structures; (2) Movement toward the highest level, theories and structures, should involve continuous recycling to lower levels so that facts, trends and sequences, and so on can be understood in relation to a more integrated whole rather than isolated bits of irrelevant information; and (3) The cluster of diverse procedures that surround the acquisition of knowledge – that dimension of learning commonly referred to as “process” or thinking skills – should themselves be viewed as a form of content. It is these more enduring skills that form the cognitive structures and problem-solving strategies that have the greatest transfer value (Bransford, Brown, & Cocking, 2000). When we view process as content, we avoid the artificial dichotomy and the endless arguments about whether content or process should be the primary goal of learning. Combining content and process leads to a goal that is larger than the sum of the respective parts. Simply stated, this goal is the acquisition of a scheme for acquiring, managing, and producing information in an organized and systematic fashion. A focus on methodology is the most direct way to prepare young people for their roles as contributors in future fields of professional involvement. A focus on methodology also means more than just teaching students about methods of inquiry. Rather, it is designed to promote an understanding of and

appreciation for the *application* of both content and methods to the kinds of problems that are the essence of particular fields of knowledge. The goal of a focus on methodology is, therefore, to cast the young person in the role of a firsthand inquirer rather than mere learners-of-lessons, and to create a mindset that prepares young students for confrontations with knowledge that are the starting point of their own applied and created knowledge.

A theory of blended knowledge

Although philosophers and epistemologists have written for centuries about the general nature of knowledge, the theory presented here is restricted to the acquisition, application, and creation of knowledge in formal (schoolhouse) learning. Thus, the main “ingredients” for developing young minds mentioned above (information, knowledge, and the creative application of knowledge) can be categorized into three general levels of knowledge depicted in Figure 1. Before describing each of these three levels it should be emphasized that while they are hierarchical in level of complexity so far as the powers of mind are concerned (c.f., Bloom’s hierarchy), it is the *interaction* between and among all three levels that creates the blended knowledge which is represented in the center of the three concentric circles in Figure 1. And, as indicated above, the investigative learner returns to various levels and sources of knowledge as particular learning situations dictate. This cyclical pursuit and application of knowledge is depicted in Figure 2.

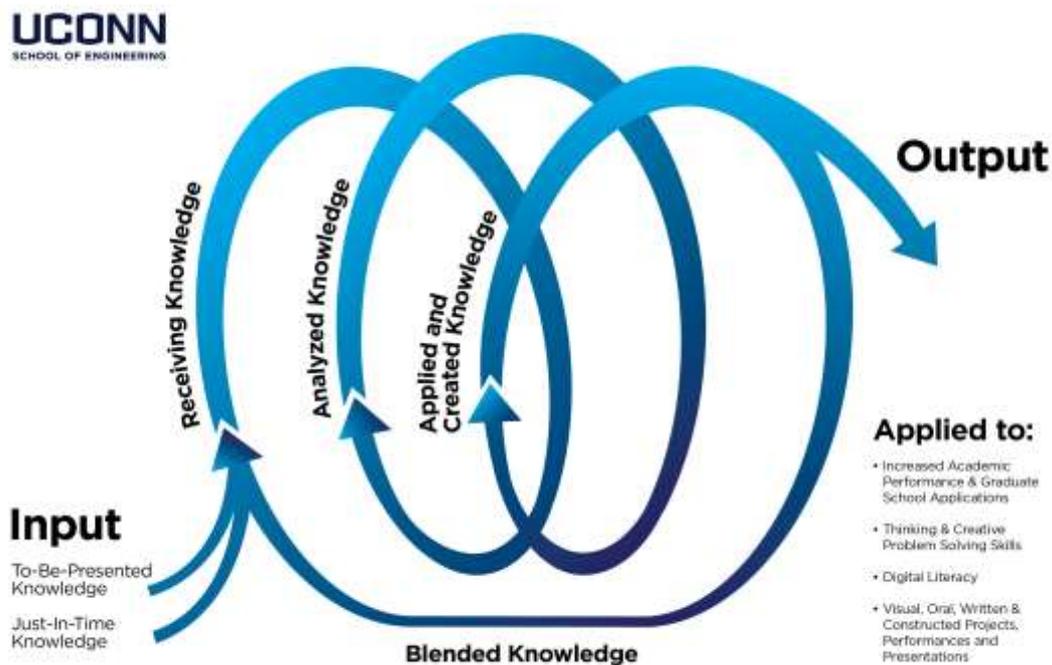


Figure 2: The cyclical pursuit of various types of knowledge.

Received knowledge

The first level of knowledge is Received Knowledge, and this is the type of material most often associated with what traditional schooling is all about. At this level, information and knowledge are frequently used synonymously; however, leading knowledge scholars define small differences (Machlup, 1980). Information captures data at a single point and refers to material that has been given some meaning by way of a relational connection (e.g., Boston and Atlanta are state capital cities). This type of knowledge is the concise and appropriate collection of information but has value only when it is made useful in situations that are relevant to the learner. It refers to a deterministic process where patterns within a given set of information are ascertained (e.g., capital cities are seats of government); what Whitehead (1929) called “inert knowledge” and described it as “...knowledge that

students can exhibit when it is specifically called for (on an examination for instance), but that otherwise plays no roles in their lives” (Bereiter, p. 309).

Received Knowledge such as facts, data, vocabulary, numeracy, names, dates, and other types of information are typically conveyed to students through lectures, textbooks, worksheets, and various types of digital media. It is the type of information that is usually assessed through standardized achievement tests or “right answer” tests constructed by teachers. Received Knowledge is the foundation for all learning and thus an essential component of the blended knowledge concept that makes up the center of Figure 1. The left side of this figure represents the major inputs to the learning process and the right side represents the outputs or what we “take away” from a learning process that blends together three levels of knowledge. Although memorization, note taking skills, and recall are the main mental processes developed for the acquisition of Received Knowledge, teachers have used attractive materials, the media, and a variety of classroom organization and management techniques to convert “raw” information into meaningful knowledge; and creative teachers have devised ways to make this level of knowledge more interesting and useful to students.

Analyzed knowledge

The second level of knowledge and the type that has frequently been associated with programs for the gifted is Analyzed Knowledge. This level of knowledge has grown in popularity in recent years due to the focus on 21st Century thinking skills, the process standards included in the Common Core State Standards (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010), and the *Next Generation Science Standards* developed by The National Research Council, the National Science Teachers Association, and the American Association for the Advancement of Science (NGSS, 2013). Kaplan (2009) discussed how this level of knowledge contributes to the depth and complexity that should be a hallmark of curriculum for gifted students. Analyzed Knowledge develops thinking skills such as: interpreting, extrapolating, recognizing attributes, discriminating between same and different, comparing and contrasting, categorizing, classifying, determining criteria, ranking, prioritizing, and sequencing, seeing relationships, determining cause and effect, pattern finding, and making analogies. These skills are typically associated with Bloom’s higher level thinking categories of analysis, synthesis, and evaluation (Bloom, 1954).

Classroom practices that promote Analyzed Knowledge are much more advanced than merely receiving, storing, and retrieving information. Discussions, debates, simulations, role-playing, critiquing, and questioning that focus on attitudes, values, conclusions, and why, how, and cause-and-effect are typically the ways in which analysis skills are developed. Analyzed Knowledge obviously draws upon Received Knowledge but it also interacts with Received Knowledge in a cyclical manner. When students are working at the analysis level they may find the need to acquire (“go back”) and obtain additional factual information to further examine or scrutinize an argument, point of view, or interpretation of a problem they are addressing. If Received Knowledge is “grist for the mill of mind,” then Analyzed Knowledge is the “relentless grinding” of information that uses Received Knowledge to develop more complex levels of thinking and understanding.

Applied and created knowledge

These first two levels of knowledge are both priorities for all of our students. The ability to solve problems evolves from retrieving facts, data, and information and manipulating this material in ways that create meaning for the individual and improve the powers of mind. More advanced levels of problem solving and the construction of knowledge, however, require curiosity, creativity, and the task commitment (Renzulli, 1982) to pursue problems that go beyond acquisition, prescribed problems, and even teacher assigned problem-based learning activities. These are traits that should be the focus of programs for developing giftedness and they should constitute the mission of gifted education mentioned above – increasing the world’s reservoir of highly creative and productive individuals. It is this broader set of skills that develops the investigative, creative, and entrepreneurial mindsets that are exactly the characteristics that we most admire in people who have made important

contributions to their respective fields of endeavor – indeed, the creative and productive people that the larger world ultimately refers to as “gifted.”

The best way to promote the use of Applied and Created Knowledge is to ensure that special programs place a major focus on providing opportunities to pursue real problems in investigative and creative ways (Hebert, 1993; Delcourt, 1994; Renzulli, 1982; Westberg, 2010). Real problems differ from other types of assigned problem solving activities in four basic ways. First, students select the specific problem they want to pursue. This selection may be restricted to an assigned topic or course (e.g., The Civil War in a history course), but within any general or specific topic area opportunities for personalization of interest creates internal motivation because students have choices based on their own interests. For example, within the general topic area of the Civil War, students might choose to study the music, uniforms or women’s clothing fashions, fiction, photography, weaponry, human rights, the biographies of famous individuals or persons from their home towns, sea battles, the Underground Railroad, the role of women, or any other issue that holds a particular fascination for the individual or group. A series of general exploratory experiences such as a speaker or virtual field trips to Civil War sites or battlefields can be used to give students ideas about the choice of a problem in which they might develop a sustained interest (see, for example, Type I Enrichment in the *Enrichment Triad Model*, Renzulli, 1977).

Second, students are guided in procedures for formulating a hypothesis or research question and the use of authentic investigative methodology such as how practicing historians go about investigating a particular area of study. Developing a hypotheses or research question, selecting a topic for creative writing, or designing an artistic or community service project ensures that students extend beyond just “looking stuff up” and reporting it! It is at this point that teachers need to be able to assist students in tracking down How-To books and web resources that guide them in finding and focusing on investigable problems. For example, in a book entitled *Understanding History: A Primer of Historical Method*, Gottschalk (1969) writes briefly about how practicing historians choose subjects and find information about them:

The beginner, with or without aid, can easily discover a subject that interests him or her and that will be worthy of investigation—at least at an introductory level. They need only to ask four sets of questions:

- (1) The first set of questions is geographical. They center around the interrogative: “Where?” What area of the world do I wish to investigate? The Far East? Brazil? My country? My city? My neighborhood?
- (2) The second set of questions is biographical. They center around the interrogative: “Who?” What persons am I interested in? The Chinese? The Greeks? My ancestors? My neighbors? A famous individual?
- (3) The third set of questions is chronological. They center around the interrogative: “When?” What period of the past do I wish to study? From the beginnings till now? The fifth century B. C.? The Middle Ages? The 1780s? Last year?
- (4) The fourth set of questions is functional or occupational. They center around the interrogative: “What?” What spheres of human interest concern me most? What kinds of human activity? Economics? Literature? Athletics? Sex? Politics? (pgs. 62 - 63)

The third guideline for investigating a real problem is that there is no single predetermined or “correct answer” or prescribed way for conducting a study. There may be some general procedural standards that apply to research in general, but the creativity literature clearly shows us that people who have taken the road less traveled are often the ones who make innovative breakthroughs in their fields of study (Barron, Montuori, Barron, 1997; Kaufman & Sternberg, 2006; Sternberg, 1988, 2007).¹ The problems that students pursue should also be “fuzzy” ones or open-ended ones, and they

¹ John Gurdon, the 2013 winner for the Nobel Prize in medicine was criticized and given low marks by a high school teacher because: “. . . he will not listen and will insist in doing his work in his own way.”

should be structured in such a way that it has the potential to change actions, attitudes, or beliefs. Teacher flexibility and a willingness to entertain and respect learning style differences are important conditions at this stage for promoting creativity and the self-efficacy that Bandura (1977) argues are important contributors to independent growth. The teacher or mentor must truly serve as “the-guide-on-the-side” by giving feedback, making suggestions, recommending and helping students secure resources, and providing general support and encouragement. The skills mentioned above for facilitating Analyzed Knowledge activities can be applied here as well. In many ways, the teacher’s role at this stage is similar to a college professor’s role when guiding a student through a master’s or doctoral thesis. This guidance may refer back to both analysis skills and the need to carry our further searches of the Received Knowledge level described above.

The *raison d’être* of the creative/productive person in all societies is to have an impact and create change for one or more intended audiences. That is the reason why writers write, artists paint, builders build, and scientists and engineers produce new products to improve existing work and to make it more effective, efficient, and/or aesthetic. *The main goal of creative producers is to make a difference.*

The final guideline for helping students at the Applied and Creative Knowledge level is to assist young people in exploring potential outlets and audiences for their work. This exploration should begin early in the investigative and creative process because it provides motivation to complete and disseminate students’ best work. An exploration of outlets and audiences allows students to become familiar with the formats and genres of the areas and disciplines in which they are working. These opportunities enable students to submit work for publication or display, both in and especially outside the school, to make presentations and performances to special interest groups, to enter their work into the almost unlimited number of special talent and academic contests and competitions that exist in practically all areas of knowledge. These highly motivating opportunities to publish, present, and perform create real world experiences to teach students about self-regulation, time management, meeting deadlines, and other executive function skills. One need only examine the legendary success of programs such as Future and Community Problem Solving, National History Day Competition, International Science and Engineering Fair, Invention Convention, and a host of other competitions to understand the role that outlets and audiences play in the creative and productive process.

Summary

This Theory of Blended Knowledge has the most critical relevance for what and how we teach high potential young people, as it focuses on opportunities for creative productivity within standard curriculum practices, and on how we train teachers of gifted and highly creative students. If one of the goals of gifted education is to increase the world’s reservoir of highly creative and productive individuals, we must devote as much attention to Analyzed and Applied and Created Knowledge as we do to requiring students to simply acquire larger and larger amounts of information. One student described her Advanced Placement courses as “...test-prep on steroids,” and said that she learned more about creativity, joyful learning, and “thinking hard” through working on the school yearbook, participating in the debating club, and preparing for a National History Day competition. *Using and blending* knowledge, both T-B-P and J-I-T, create a different brand of learning, and this brand should be the focus of work with high potential young people.

This theory simply portrays the ways that different kinds of knowledge interact with one another to produce “blended knowledge” as depicted at the center of Figure 1. Learners receive information, but when they begin to analyze this information they may find a need to “go back” and gather additional material for a more advanced analysis. Similarly, when they reach the applied and creative stage, it is often necessary for them to return to the received and applied levels; and “return trips” to these levels are usually based on just-in-time rather than presented information. And in cases when new knowledge, innovative contributions to a field, or even new ways of analyzing data (e.g., Big-C contributions such as Rubin’s Causal Model in statistics) are made at the applied and creative

level, the innovative person will then have added content that will become part of received knowledge in other learning venues. Although this process is a natural way that learning takes place, an overly standardized test-prep curriculum that severely emphasizes received knowledge can and will “discriminate” against both the analyzed and applied/creative levels of learning. Although this theory ideally can be applied to learning situations for all students, the inclusion of the applied and creative level of knowledge is most associated with the goals that should be allied with programs for gifted and talented students. It is for this reason that the theory presented here has special relevance to the pedagogy advocated in talent development programs. The ways in which we develop curriculum, instructional techniques, and train teachers to work with gifted students strives to build an identity that is qualitatively different from general educational theories.

Like any other conceptual formulation, this theory is designed, first and foremost, to generate research testable hypotheses. Are accelerated courses that only provide advanced coverage of received knowledge producing desired results? Does adding analyzed knowledge result in different outcomes? What happens when we add all three levels to produce truly blended knowledge? These questions strike at the heart of the age-old dichotomy in our field between acceleration and enrichment. The Theory of Blended Knowledge described in this article can and should be tested, as it asserts that *both* acceleration and enrichment should be important components of gifted and talented programs.

The right hand side of Figure 1 represents the outputs of a blended knowledge approach to learning and creative productivity. Increased academic achievement in the traditional sense is mentioned first because, whether we like it or not, any theory that does not include advanced content and the benefits of acceleration is logically flawed and will be rejected out of hand by policy makers and administrators. But a focus on 21st Century skills has caused some reform-minded policy makers to embrace the importance of including Analyzed Knowledge in the goals of general education. It may also be reasonable to assume that these persons will see the value of considering the importance of blending all three levels of knowledge discussed here to further enhance creative productivity in our high potential students. Finally, it may even be reasonable to hope that they may see some logic in giving students at all levels opportunities to engage in some of the activities that promote Applied and Created Knowledge as well as Received and Analyzed Knowledge. The enjoyment, engagement, and enthusiasm for learning that results from blending all three levels of knowledge in the learning process could reduce the achievement gap and reduce the boredom factor that continues to plague so many students in our schools, especially in schools serving low income students. This challenge may be one of the first research questions that this theory could promote. A blended knowledge theory is particularly relevant to our highest achieving students (regardless of income level) because it represents the *modus operandi* of gifted contributors in the larger world of knowledge construction, usage, and dissemination.

The Theory of Blended Knowledge draws upon the wisdom of intellectual founders in the field of epistemology, it takes into account the over-standardization of formal schooling that has taken place over the past several decades, and it recognizes the dramatic changes in learning that are now possible through the use of technology. The theory also has special relevance to gifted education because knowledge creation, utilization, and diffusion are what creative and productive people do. The type of learning advocated by this theory is the way that the pursuit of knowledge naturally occurs in “real world” places. Scientists in research laboratories, writers working on a book or play, and social scientists gathering data to analyze various human behaviors do exactly what this theory specifies. If we want our most able young people to think, feel, and do like practicing professionals, we must include in their overall school experiences these kinds of opportunities to pursue and act on existing knowledge as it is done outside of formal schooling. Although learning in this “natural way” should occur for all students and at all grade levels, mass education and the text book/testing industrial complex have kidnapped the process by over-prescription, a test-prep driven curriculum, and a linear/sequential interpretation of learning hierarchies.

The current focus on deductive, didactic, and prescriptive approaches to “canned curriculum” has resulted in limited opportunities for inductive, investigative, and inquiry approaches to learning. This emphasis has been especially detrimental to our most able students by turning them into efficient lesson learners and consumers of knowledge, but limiting their opportunities for developing high levels of creative productivity and an *investigative learning* mindset. The young people who have the potential to make significant contributions to the arts, sciences, and all other areas that result in economic, social, and culture growth cannot change the world if educators do not integrate applied and created knowledge with advanced content. Like any other theory, I hope this Blended Knowledge Theory will generate research on the parts of interested scholars, and will serve a practical purpose of causing us to reexamine our mission, goals, practices, and especially the ways in which we train teachers who will work with gifted students. An important part of the research that this theory might generate should focus on longitudinal studies of highly creative and productive adults whose work has made a difference in their chosen fields of endeavor and even changed the world. If we want special programs and services for high potential young people to gain the recognition and support we advocate, the best “data” we can put forward is testimony that demonstrates their gifted programs made a difference beyond merely enabling them to earn good grades, high test scores, and advanced degrees. It must demonstrate that these programs have, indeed, contributed to expanding the reservoir of the world’s highly creative and productive individuals.

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Specific Learning and Teaching Strategies That Work, and Why They Do So

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Abstract

Learning and teaching science challenges many students and instructors. From four decades of helping students learn, ourselves teaching, and aiding educators teach chemistry, we have formulated some strategies that prove effective in improving learning and teaching. Specific teaching tactics such as establishing a contract for grading, and using humor and demonstrations in the classroom, work very well. Learning strategies include taking notes by hand, using homework to develop independent problem solving skills, and creating practice exams. Studies of cognition provide the rationale for the success of such strategies. We also discuss potential pitfalls of each. Finding your learning style, using metacognition, and the mentor/apprentice bond make for optimal learning and teaching.

The two of us have been teaching and helping others to teach chemistry at every level – from high school teachers to undergraduate and graduate students to university faculty – for over four decades. From that experience have come a number of teaching and learning tactics that we find effective in facilitating student learning. Initially improvised, these strategies are more than gimmicks, for they have proven themselves in practice. Here we share some of them.

Since we are inclined to be reflective as well as pragmatic, we've also sought out in recent advances in cognitive psychology, and in the scholarship of teaching and learning, insight into why these approaches work. We think through why they are of use in those most magical and mystical processes of learning and teaching any subject, not just chemistry. And we also spell out potential problems.

Caring deeply for student learning entails keeping an eye out for what works for others. Perforce, this means borrowing and adapting. Thus a potential injustice in our account is that credit may not be given to the real innovators. Frankly, we do not know where some of the strategies we suggest originated – in examples by others, or out of our own improvisations as we struggled to become better teachers. Many people have independently come to similar practices.

Some of what we write is addressed to teachers, some to students. This is deliberate. Cognizance of learning strategies benefits teachers, and awareness of teaching strategies can help learners understand the motives of teachers. Teaching and learning are a double flame.

Six learning strategies

1. Take notes by hand, rework them the same night:

Take notes by hand, even if the class notes are being provided by the instructor or a for-profit service. Even if they are web-cast. Preferably not later than the evening of the class day, rewrite your notes, by hand, amplifying their content.

Notice that this process involves two stages – taking the original notes and then rewriting/reworking them. There are various note-taking systems², including the Cornell Note Taking System³, the mapping method, the outline method, etc. that students can learn. During the rewriting stage, it is important that you not just recopy your notes, but rather both condense and extend them where appropriate, paraphrasing them “in your own write.” So that you make the meaning your own.

The question of whether taking notes on a laptop or by hand is more effective is a contentious one⁴. We think taking notes by hand works best, but our preference may be due to our age and educational experience. A real concern, however, is that much of the information in science courses is graphical and based on mathematical equations.

Students find it difficult, if not impossible, to jump from words to chemical structures, graphs, and equations if they are taking notes on a computer. We see that students who take computer notes waste extraordinary amounts of time in the frustrating task of making sure formulas and structures are drawn correctly by digital methods.

Why this works: It is now well established that active engagement in the process is imperative for learning to occur⁵. When students take their own notes, they are engaged, in real time, and their minds focus on the task. For kinesthetic learners, the movement involved in taking notes facilitates learning.

The process of paraphrasing and rewriting the notes shortly after lecture helps to transfer the information from short-term to long-term memory^{2,6}. If the rewriting is delayed longer than twenty-four hours, much of the information needed to flesh out the notes taken in class will have disappeared from memory. And... it is so much better that gaps in understanding surface in the engaged rewriting of notes, rather than the night before an exam.

Potential Problems: Students may feel that they do not need to rewrite their notes if they understood the material in class. And it takes time to do so. However, the review that comes with the rewriting deepens learning and facilitates long-term retention of the information⁷.

2. Missed a lecture? Get your notes from a live person:

If you must miss a class, rather than simply download the notes from a webpage, get the notes from a fellow student.

Aside from being a great way for men and women to meet (in every combination), this strategy is another way into group discussion and learning. It is important to develop relationships with other class members and to form study groups (see below) early in the course.

Why this works: During discussion of class notes, much learning takes place. A typical scenario: Student A (the one who missed lecture and is borrowing the notes) says “I don’t understand this part of what you wrote,” to student B, the note taker. Because B is a fellow student, A is comfortable asking her the question, while A might be reluctant to ask it of the course instructor. B explains, and is, of course, *ipso facto* engaged in the most salutary of learning actions, teaching.

Potential problems: The note taker may not understand, or may propagate a misconception. Additionally, some people are just too shy to ask another human being.

² <http://sas.calpoly.edu/asc/ssl/notetaking.systems.html>

³ W. Pauk, *How to study in college* (Houghton Mifflin, New York, 2000).

⁴ <http://www.thefulcrum.ca/node/580>

⁵ J. D. Bransford, A. L. Brown, R. R. Cocking, Eds., *How people learn: Brain, mind, experience, and school* (National Academy Press, Washington, DC, 2000).

⁶ K. A. Kiewra, *Educ. Psychol.* 20, 23-32 (1985)

⁷ A. King, *Am. Educ. Res. J.* 29, 303-323 (1992).

3. Optimize learning from homework and text examples:

Most students do their homework in solitude (or as much of that as a residence hall room allows) by trying to follow text examples of similar problems. But often the text examples are not exploited for the learning opportunities they provide.

Here is a simple and effective strategy for approaching text examples and assigned homework:

- Do the obvious: study the text and lecture information relevant to the problems;
- Treat the examples in the text and in lecture notes as homework problems. Read the problem statement in the example, but do not look at the answer, cover it up. Now work the text example;
- Compare your approach to the text's, not just your answer. Is the example problem solved by a method identical or close to yours? If not, yet your answer is correct, don't be afraid to continue using your method. But try to understand the text's. There are often several ways to do a problem; and
- Answers to homework, provided by the instructors, of course, should not only be numbers – answers should always include ways of working each problem. If they do not, the instructor and teaching assistant should be encouraged (that's putting it mildly) to provide complete solutions, even alternatives. A problem set solution (and examination solutions, the most carefully read information in the entire course) is a teaching opportunity.

Why this works: Students develop the essential skill tested by all exams – the ability to work a problem without using a model of how it should be worked. This approach to homework focuses on *methods* rather than final *answers*. Furthermore, alternative methods are explored so that students learn to be agile, flexible thinkers. This method also affirms a student's intellectual intuition.

Potential problems: Students may be tempted to peek at the examples, a solution manual or a website rather than spend the time to figure out how to work the problems themselves.

4. Study first by yourself, then in a group, then by yourself:

The idea here is simple: First, you should try to do a homework problem or prepare for an exam on your own. Then, the collective wisdom of a group is enlisted. Three to six fellow students who have each done their best to digest and absorb difficult material are powerful resources for each other. Finally, you must return to solving the problem set or facing the exam on your own. The sequence here is important.

Why this works: Not all instructors are comfortable with homework done in groups, but our experience is that groups are very effective, both for problem set solutions and studying for exams. Do-it-yourself is the primary principle of active learning. But groups can help resolve the occasional blind spot -- usually, someone in the group will know how to do the problem. Social constructivist learning theorists have shown that meaningful learning results from small study groups with two crucial features: discussion and problem solving activities^{8,9,10}. Finally, to cement their learning, and with existential courage, the students must face the material by themselves.

The potential problem: After a period of optimal group functioning, groups inevitably organize themselves along lines drawn by personality characteristics, in particular on the active/passive axis. A group's value quickly diminishes for a passive personality; such students will too easily fall into a pattern of merely listening. Groups may converge on a wrong approach; this is

⁸. M. G. Jones, L. Brader-Araje, *Am. Comm. J.*, 5(3), 1 – 10 (2002).

⁹. D. Johnson, R. Johnson, *Learning together and alone. Cooperative, competitive, and individualistic learning* (Allyn and Bacon, Needham Heights, MA, ed. 4, 1994).

¹⁰. L. Springee, M.E. Stanne, S.S. Donovan. *Effects of small-group learning on undergraduates in science, mathematics, engineering, and technology: A meta-analysis*. *Review of Educational Research* 1999;69:21-51; <http://www.wcer.wisc.edu/archive/C11/CL/resource/scismet.htm>

less likely to occur when students are encouraged to use their resources to double check all information. And it will not happen when all students feel equally empowered to contribute to the group discussion.

There is available information on group study¹¹ that will raise the likelihood that the group will be effective for all members. Several websites provide excellent tips on forming and running successful study groups¹².

5. Enter the tester's mind:

Make up practice quizzes and tests for each other.

Why this works: One of us tells his students that “the only way you will get into my mind about the exam is... to try to get into my mind. That means to do what I do, and make up an exam.” Creating a practice exam involves not only the selection and organization of all the material (including choices about what is representative and what is important) but also discussion of the exam in a group setting. Its value as a learning tool cannot be overstated. Usually, one group member, on seeing another student's trial exam, cries out “The professor (we suspect more colorful characterizations would be used) would never ask that!” Others react, and a discussion emerges about what material is important and what is not. That's just what we want to encourage.

Another way to enter the tester's mind is by teaching the material, one student to another. When one of us asks instructors attending faculty development workshops when they began to develop a deep understanding of the conceptual structure of their discipline, most say that it did not happen until they began teaching. The other author got an A⁺ in a graduate school thermodynamics course, but never really, really understood thermodynamics until he had to teach it.

Potential problems: This takes considerable time and discipline on the part of students. And role-playing, such as is involved in taking the teacher's place, is not easy for some.

6. Set attainable goals:

Perhaps there is something to learn from standard psychological advice on how to help oneself out of (subclinical) depression. It's not that studying is depressive; but if you are spinning your wheels and studying does not lead to learning, the process can share some symptoms with depression – a perceived inability to act, for instance. For this reason, it is important to (a) tackle small, achievable tasks and (b) try to focus on other people, not yourself. When you teach others, you step outside of yourself, and interestingly that becomes for you a path to learning.

The relevant advice in constructing exercises (and tests) is to move slowly, from simple problems, to more complicated, integrative ones. Teaching assistants should work in the same way in their recitation sections.

Why this works: Success, self-achieved, builds confidence, and so is a very powerful motivator. When you attempt to reach a goal that is within your grasp, a wonderful cycle of initial success, more effort, and additional success is put into motion. And helping other students moves one past disappointment about not getting things right oneself. Usually, you can help someone else get going; the gratification is motivating for both parties in such an exchange.

¹¹ http://teaching.berkeley.edu/docs/study_groups.pdf;
<http://ezinearticles.com/?5-Tips-to-Form-a-Successful-Study-Group&id=2458407>

¹² <http://www.how-to-study.com/study-skills/en/studying/38/study-groups/>;
<http://web.mit.edu/uaap/learning/study/groups/index.html>;
http://businessmajors.about.com/od/studentresources/a/Study_Groups.htm

Potential problem: What is easily attainable for one student may be very difficult for another. Conversely, an attainable goal for one student may be trivial for another, requiring no effort whatsoever. This may result in a student assuming that learning chemistry is effortless, and s/he will not develop the learning skills necessary for performing more cognitively demanding tasks.

Six teaching tactics

1. A contract, not a curve:

We recommend instructors grade on a contract with the students, whereby grades are based on a combination of a major absolute performance component (examinations and quizzes) and a minor — as small as possible — “curved” part of the course (such as labs and other multi-section pieces).

The only reason for curving should be fairness – if several graders are involved, for instance. The grading criteria must be made known to the students at the beginning of the course. An instructor might say to the students: “An A of some kind is 85% mastery as judged by various components, a B is 75%, a C is 60%, and 50% is passing. I will not raise the borderlines, but I may lower them if I have misjudged the level of mastery.” In other words, the line for the A’s may go down to 83%, but never rise higher than the contracted 85%.

Why this works: The students are empowered when they see that the outcome of their course grade is largely or entirely dependent on their work in the course, rather than on a comparison of their work with the work of others. Young people react very positively to fairness; a contract boosts confidence.

Potential problems: The professor will need to construct exams such that the level of mastery of the material is accurately reflected by the grade that students achieve on the test. In psychometrics, this is referred to as content validity¹³. To be realistic, some faculty have trouble doing this.

In particular, one has to watch for misjudgments of mastery in multiple choice exams of the type where the simplest arithmetic mistake will yield an incorrect answer.

The kind of contract we recommend is very scary to some department administrators, who may be insistent that each course have a predetermined median grade. Such worries, amusingly, reflect a lack of confidence in faculty members’ ability to assess mastery levels.

2. Bring “Real Life” into the classroom:

News, crises, and everyday life open the mind. Devote 5 minutes of each class to a discussion of science in current affairs, preferably using ideas from print media, or television or radio news reports. Every minute spent this way is worth it.

Newspapers (print or online editions) sadly carry little science; what they do carry is often health-related. As far as chemistry goes, the papers, or the web-based new media, rarely give chemical structures but sometimes name the molecules or drugs in their stories. Every morning the instructor might profitably scan the health and science stories in the New York Times or an equivalent resource. With Wikipedia, or WolframAlpha, or chemicalize.org, the structure of a molecule can be retrieved immediately. It should be shown in class, along with a screen shot or webpage of the newspaper or magazine story.

Our experience is that from a stream of such “short stories from the real world” comes appreciation of the relevance of what is taught. In chemistry, students begin to see that small

¹³. S. Haynes, D. C. S. Richard, E. S. Kubany, *Psychol. Assess.* 7, 238-247 (1996).

differences in the structures of molecules may determine whether a substance will hurt or heal. Or both. For example, they may begin to understand that not all cholesterol is bad, or that crystal meth and the decongestant it's illegally made from in home laboratories differ by just one atom.

Why this works: Of course, motivation for learning is enhanced by the perception that the material studied is relevant. People are curious about how things work, and disasters arouse both fear and compassion towards our fellow human beings.

But the discussion of newsworthy topics may not be the most important part of this strategy. Ultimately, bringing real life into the classroom day in, day out builds a bond between teacher and student. Students begin to feel that the instructor has gone to the trouble of reading the paper or searching other media that very day (caring trumps content!) and of making a slide which demonstrates that s/he cares that students learn.

Potential problems: The discussion of "What's in the news?" could eat up precious class time. Depending on the topic, student interest may be intense; if so, the professor can simply suggest continuing the discussion during the next class period, or outside of class during office hours.

3. "Cheat Sheet" or prompt to learning?

Here's a strategy on which the two of us disagree: Allow each student to bring into a test or final examination an 8½ by 11 page on which anything in the world can be written.

One of us feels strongly that as we move toward textbooks sold not as print copies but available for download, and as it becomes increasingly more difficult to forbid a student to use a computer or fancy calculator in an exam situation, we are moving toward open book exams anyway, like it or not. He asks "why not invent a new way of teaching for that eventual situation?"

The other co-author feels that this is not a good strategy because she has observed its negative consequences. In her experience, most students think that if they can bring in a "cheat sheet" to the test, they need not know anything because everything relevant can be written on the sheet. These students fail tests because they spend most of their study time looking for what to copy onto the sheet, information of which they have no conceptual understanding. Or they spend time during the exam regretting that they didn't put "the answer" on the sheet. She feels that professors should provide information (such as constants) that students need, but are not expected to memorize. She stresses to students that they can only think critically using information safely stored in their minds – information that they *own*. "Cheat sheets" are very attractive to many students, but she has seen very few who use this tool to their advantage rather than to their detriment.

Why this might work: The sheet serves as a security blanket for scared students, of course. But its true purpose is to make the student review the material, to make judgments about what is essential and what isn't, and to organize the material. The sheets can become a prime learning tool. With progress in the course, one of us has observed that students realize this, saying after an exam "I didn't even look at the sheet."

Potential problems: A number were mentioned above. Furthermore, even if everyone in academia used this strategy, the standardized professional entrance tests such as the MCATs, LSATs, and GREs of this world do not allow it.

4. Turn it around

Consider a typical classroom exposition of a principle: "You have A, you apply a way of analysis that allows you to conclude that B will happen." There's a natural tendency for students to view that particular analysis as the only approach to problems and exercises involving the principle. The teacher can combat that outlook, and reinforce the primacy and power of the principle, not the specific example, by immediately following up with a

second example where the question is turned around: “You get B’, and applying the same ideas, you can figure out what A’ led to that.”

To be specific: Suppose a teacher in an introductory chemistry course has just gotten through discussing, say, the mass relationships in a combustion reaction: octane (C_8H_{18}) is burned with unlimited oxygen to give water and carbon dioxide. He or she then continues:

“Here we’ve seen how to figure out that if you burn 114 grams of octane with an unlimited amount of oxygen you will get 352 grams of carbon dioxide. But wait, the same ideas can be put to work in many more problems. Here are two:

- I don’t have an unlimited amount of oxygen (the air intake on my car is clogged), I have 200 grams of O_2 . How much carbon dioxide would I get then from my 114 grams of octane? This is a so-called limiting reactant problem; seemingly different, tougher. Yet the same ideas are at work.
- My Volvo runs 8,000 miles a year, at an average fuel consumption of 22 miles per gallon. How much CO_2 am I putting into the atmosphere each year?”

The teacher elicits the solutions to these problems from the students, helping when they get stuck. Finally s/he says: “I’ve just used the basic ideas of mass relationships in chemistry in three different ways. Now, I want you to go home, and make up a fourth way to use the same equation to probe the idea of mass relationships.”

A physics analogue would be to ask for the range of an artillery piece, given a firing angle, a mass of the projectile, and an initial velocity, assuming frictionless flight. Then the instructor could ask what an observed range tells you about the velocity and the other factors specified.

Why this works: Sure, repetition of a concept reinforces it. But there is more – understanding is applying productively a heuristic, theory, or model to a set of facts. There is nothing more convincing of a concept’s value than the feeling that it can be used for not just the problem that occasioned it, but for many others problems. Also learning is made fun by one of the elements of humor – surprise. And turning things around has an element of surprise to it. Imagine — an environmental conclusion of vast importance could come from simple stoichiometry!

Potential problems: Repeating the same question type in different permutations may seem repetitive to the teacher; we think it is rarely so to the student.

5. Use humor

When one of us asked a group of Louisiana State University students to explain the difference between studying and learning, most replied that studying involves forcing yourself to memorize uninteresting stuff (as they put it), whereas learning means gaining insight into stuff you actually care about. To one and all learning was most often fun, but studying was usually tedious.

Here then is one of our great problems. How can the teacher and the student break down the perceived barrier between studying and learning? How can we build into the travails of most study some of the psychological fun of learning – the joy, that tremendous self-enhancing sensation of understanding after not understanding, that empowering flow?

Judicious doses of humor help a lot. Few chemical stoichiometry problems or lists of names of the bones in a foot could be imagined to evoke raucous laughter. But lapsing into a fragment of “Dry Bones” (the thighbone is connected to the hipbone...), or playing Tom Lehrer’s “Element Song”, or Blackalicious’ “Chemical Calisthenics”, or Diego Carrasco’s “Química” breaks tedium, gives the feeling of fun. Such musical instances have been assembled¹⁴.

¹⁴. S. Alvarez, *New J. Chem.* 32, 571-580 (2008).

Humor is also a smile, or a surprise, or turning things around and looking from a different perspective. All of these things are part of what made the Marx brothers so good. Work in that direction, work to achieve surprise. Look in the course material for mistakes that lead to weird contradictions or unphysical results. These are the intellectual equivalent of pratfalls.

Why this works: Humorous situations are attention-grabbing, emotionally satisfying, and can create an environment that promotes long-term retention and learning¹⁵. Humor also reduces stress, allowing students to enjoy the learning experience. Humor humanizes the instructor, builds a bond.

Potential problem: If too much humor is used students may fail to take the course or the instructor seriously. Also, the sense of humor is very individual — what one person thinks is funny, another finds stale. Fun and hard work most certainly coexist, but students must not underestimate the serious effort and time commitment required for success.

6. Demonstrate!

Not every subject lends itself to doing demonstrations. Chemistry certainly does. Mind you, demonstrations did not come easily to one of us, a theoretical chemist. But he took to it, and in fact learned how to turn white wine into red (and back again) from his coauthor.

The advice here is simple: Do still more demonstrations.

Demonstrations are somewhere between magic and science¹⁶. Somewhere between gripping theater and chemistry. Somewhere between circus and the Zen koan that bestirs the dormant knowledge in a student's mind.

We know no deeper silence in a classroom than that which accompanies the first seconds of a demonstration. Theater directors and nervous concert hall managers envy us those natural moments of rapt attention. The auditorium is hushed, awaiting change. The demonstrator does not fail to provide it, with color, flame, smoke, or explosion. There ensues catharsis for the lecturer, a catering to all the senses of the audience, and, sometimes the only thing the students remember from a course.

Yet in the hands of a good teacher, so many more and valuable things may flow from that demonstration:

- A repeated metaphor for the heart of chemistry, which after all is about substances and their transformations;
- The essential question, whose asking makes a teacher delirious if it arises in the minds of just a few: “What is happening?”; and,
- A return to the real world; science works with flights of imagination interspersed with mundane reality. The process of teaching naturally stresses symbols — words, concepts, and theories. The demonstration touches the earth. It may be staged, but it is tangible.

Why this works: On a simple level, a demonstration is a shifting of gears, from lecture to action. It is an intellectual alarm clock — “time to wake up, something is going to happen!” As academic theater, it crosses for a moment the bridge from learning to entertainment. In the hands of a good demonstrator, it crosses back to content, and so enhances learning.

Potential problems: At times the link between demonstrations and what is being taught is weak — so few instructors explain the complex kinetics of a typical blue-yellow oscillating reaction.

¹⁵. M. K. Morrison, *Using humor to maximize learning*. (Rowman & Littlefield Education, Lanham, MD, 2008).

¹⁶. R. Hoffmann, preface to H. W. Roesky, K. Möckel, *Chemical Curiosities* (VCH, Weinheim, 1996).

Moreover, a course overloaded with demonstrations could sacrifice learning for entertainment. But, perhaps in the lecture room it is as Daryle Singletary sings: “I ain't never had too much fun. ¹⁷”

So far, we have presented quite specific strategies. We now turn to some general observations about the education process, awareness of which can greatly enhance learning. These are directed toward both the learner and the teacher.

Three transforming motivators

1. Learning styles matter:

A student's learning style impacts the way s/he prefers to take in information, process that information, and interact with others ¹⁸. Some students prefer to memorize discrete facts and specific formulas and then apply them, whereas other students prefer to use broader concepts and organizing principles to derive the discrete facts and formulas themselves. Learning style can also refer to a person's preferred modality -- visual, auditory, read/write, or kinesthetic ¹⁹, or to a number of other characteristics, such as personality type, for example extrovert/introvert, sensing/intuitive, thinking/feeling, or judging/perceiving ²⁰.

It is important for students to become aware of their learning styles and for teachers to know that there are different ways to learn, that more roads than one lead to this Rome. Why impose your way (and get frustrated when people don't use it) when you can encourage your students to learn in their own, optimum ways? When students become aware of their learning preferences, they learn more efficiently by, for example, converting lecture notes or course manual or text into their preferred format.

But what if a student's learning style does not match an instructor's teaching style or, worse, the learning culture of an entire discipline? The rich fields of human thought and practice are not tilled in just one way. Becoming aware that a task can be done differently is the beginning of learning how to do it differently. In a multivalent, diverse world, we can learn to learn in diverse ways without necessarily giving up our preferred ways of coping with knowledge and process.

Still, there is a problem here, epitomized in the comments of a person (the daughter of one of us) who crossed the worlds of science and the arts:

“How to make Ulysses palatable to a materials scientist or stoichiometry bearable for a DJ? I do not think it is so easy to get non-quantitative people to learn quantitative stuff. It requires blood, sweat, and tears, just as I, formerly a primarily intellectual, non-physical person, have torn my hair out and endured many humiliations in order to become a fully realized, physically capable artist.” ²¹

Unbridgeable as it might seem, we have to try to cross the gulf. Some teaching strategies outlined above may serve – the use of science in the news, humor. One can look for chemistry in culture, culture in chemistry. The environmental and ecological is a natural bond – it's nice to worry about how much CO₂ cars put in the atmosphere. But approximately how much is it in fact?

A potential difficulty is that when students determine their preferred learning style, they may be tempted to think they can learn only in that way. A student who is a visual learner, when confronted with text that is devoid of any pictures or figures, may conclude that the material is impossible to learn. It is important to stress that learning styles can be learned; just being aware that

¹⁷ Lyrics and music for “Too much fun” are by Curtis Wright and TJ Knight.

¹⁸ S. Cassidy, *Educ. Psychol.* 24, 419-444 (2004).

¹⁹ www.vark-learn.com

²⁰ www.myersbriggs.org

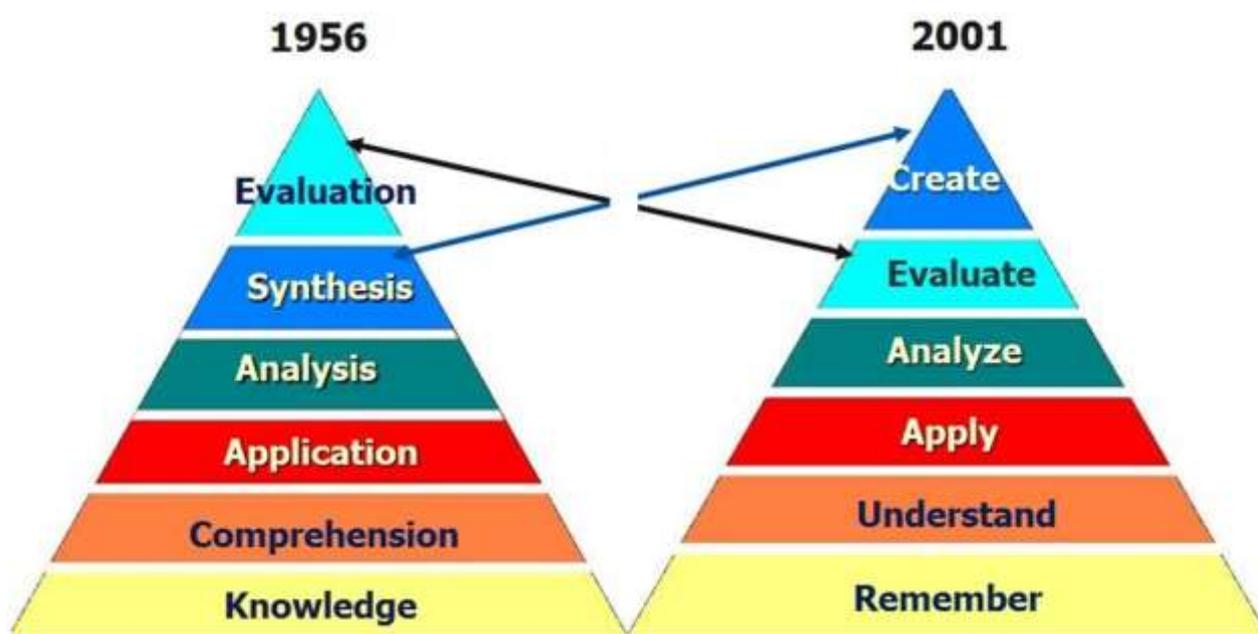
²¹ S. McGuire, personal communication, November 27, 2009.

something may be learned in a variety of ways helps. When students investigate a spectrum of strategies, consistent with the gamut of learning styles, they broaden their learning preferences and become better learners.

2. Learn to learn:

Most students think that learning selected terms, definitions, and solutions to specific problems is the way to perform well in courses²². Few of them realize that learning is a process, and that there are various stages of learning²³. Learning how to learn, through examples, really helps.

In 1956 Benjamin Bloom and colleagues identified levels of learning proceeding from rote memorization through comprehension, application, analysis, and synthesis, finally to evaluation²⁴. Recently, this taxonomy has been revised²⁵ and verbs used to describe the levels. Additionally, the top two levels have been reversed. In the new taxonomy the levels proceed from remembering through understanding, applying, analyzing, and evaluating to creating. (See Figure 1 below)



http://projects.coe.uga.edu/epltt/index.php?title=Bloom's_Taxonomy

Figure 1: A comparison of the levels of learning described by Benjamin Bloom and colleagues in 1956 and the revised version as introduced by his former students in 2001. The original version used nouns to describe the levels, whereas the newer version uses verbs. Additionally the newer version identifies creating as the highest level, whereas the original version places evaluation above synthesis. Both versions are currently widely used.

We have found that teaching students how to learn has transformed many of them from rote memorizers and regurgitators into independent, self-directed learners. Showing students how Bloom's

²² S. Y. McGuire, *The Learn. Assist. Rev.* 12, 33-45 (2007).

²³ S. Y. McGuire, in *Survival Handbook for the New Chemistry Instructor*, D. Bunce, C. Muzzi, Eds. (Pearson Prentice Hall, Upper Saddle River, NJ, 2004), chap. 8.

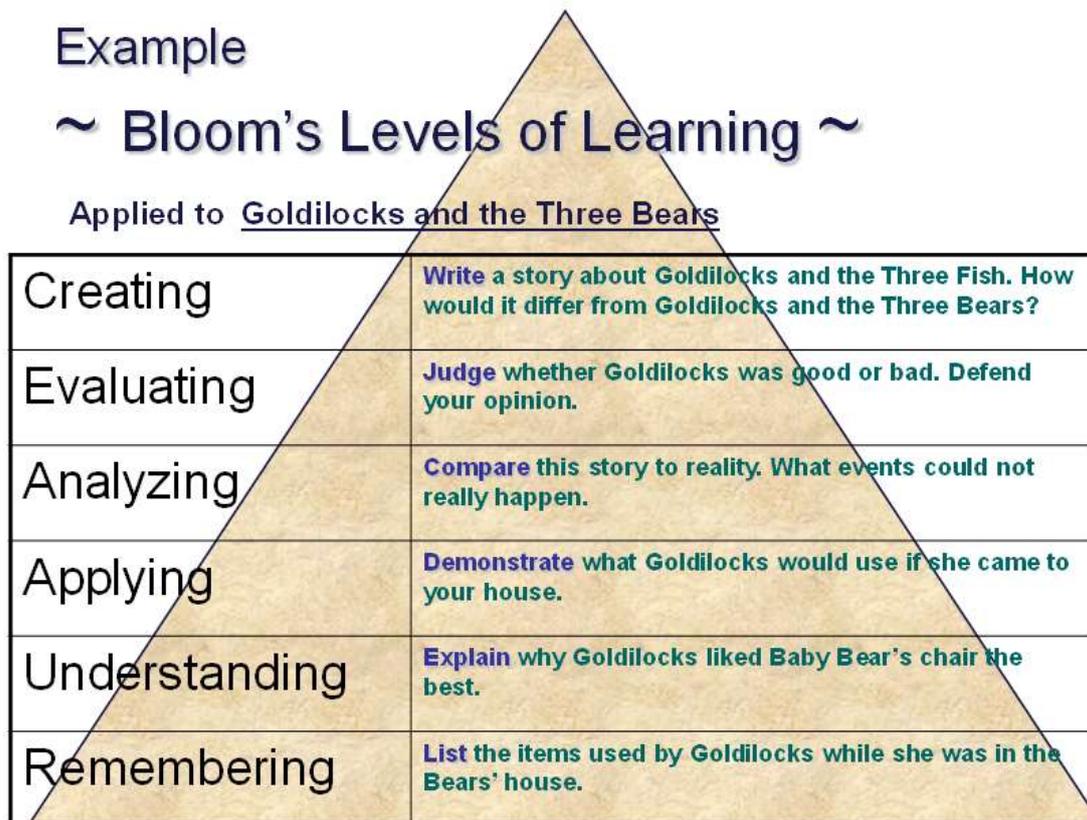
²⁴ B.S. Bloom, Ed. *Taxonomy of educational objectives. The classification of educational goals. Handbook I: Cognitive domain*. David McKay. New York, NY, 1956).

²⁵ L. W. Anderson, D. R. Krathwohl (Eds.). *A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives: Complete edition* (Longman, New York, 2001).

Taxonomy is applied to “Goldilocks and the Three Bears” helps them understand the distinctions between the levels. (See Figure 2 below)

Concept maps (^{26, 27}), graphic representations of relationships and applications of concepts in a field, are a very useful tool for moving up the learning pyramid,

In addition to teaching students about Bloom’s taxonomy, we have found that when students learn about metacognition (thinking about one’s own thinking) ^{28,29}, they transform their attitudes about learning, their methods of study, and their grades. Metacognition is a way of standing outside, of willed thinking about the acquisition of knowledge and understanding. That impartial and reflective outsidersness is also a useful quality for scientific research, or inquiry of any kind.



Adapted from: http://www.kyrene.k12.az.us/schools/brisas/sunda/litpack/BloomsCriticalThinking_files/v3_document.htm

Figure 2: Bloom’s Taxonomy levels applied to learning tasks associated with the children’s tale of “Goldilocks and the Three Bears”

Is there a potential danger of talking too much about the meta-world, at the expense of applying what one has learned to the academic subject at hand? An introductory chemistry course is not a philosophy of education course. We may have a disagreement between the authors here (again?!). One of us (guess who) can’t get enough of metacognition (because she has seen countless students improve their test scores from below 50 to over 90 in a matter of weeks, just by using

²⁶. J. D. Novak, *Learning, creating, and using knowledge: Concept maps as facilitative tools in schools and corporations* (Lawrence Erlbaum Associates, Mahwah, NJ, 1998).

²⁷. J. D. Novak, D. B. Gowin, *Learning how to learn* (Cambridge University Press, Cambridge, 1984).

²⁸. J.H. Flavell, Metacognitive aspects of problem-solving. In *The nature of intelligence*, L.B. Resnick, ed. (Erlbaum, Hillsdale, NJ, 1973).

²⁹. J.D Bransford, A.L Brown, R.R. Cocking (2000), (Eds.). *How people learn: Brain, mind, experience, and school*. (Washington, DC: National Academy Press.)

metacognitive learning strategies!), while the other one of us tires, wants to grapple with real teaching. We do agree that when students become fluent in the language of chemistry (or any subject) their metacognitive sophistication will increase to the level that they no longer have to consciously think about it.

Finally, a word about memorization, the first level in Bloom's taxonomy and the bane of teachers desperately trying to impart genuine understanding. Could memorization in fact be a learning style? There are courses ranging from history to chemistry to anatomy, where some memorization is required. Understanding is partly formed by finding a point where you stop asking questions, so that you don't get caught in an unproductive reductionist mode^{30,31}. Consequently, instructors must take care to explicitly point out what material is simply to be memorized, and what material s/he expects students to understand and apply.

3. The mentor/apprentice bond

The feeling that the teacher knows more than you -- knows more ways to transform raw facts into understanding or how to actually make an object or molecule -- can intimidate you, as a learner. You might think, "How could I possibly learn to do that?" But when respect for a teacher's mastery accompanies a second feeling, that the teacher cares deeply about transferring knowledge and understanding directly to you, then a mysterious psychological force is turned on -- the mentor/apprentice relationship.

There is nothing about the mentor/apprentice linkage specific to learning science -- it is a constant of human society. It is how the metalworkers of Benin passed on their expertise; it is how a 17th century student of a Raku master in Kyoto himself was transformed into a ceramic artist; it is how coaches motivate athletes.

The reason the relationship works so well as a learning/teaching strategy is, we believe, two-fold: First there is a simple motivating force: the student admires the mentor (admiration does not exclude resentment of a perceived taskmaster), the student wants to gain the mentor's ken. Second, learning is not a process which insists on perfect understanding at every step. That's a caricature of mathematical proof. At its best, learning in science is a nonlinear sequence of observing facts, then trying to explain them, and in the process gathering or being confronted with further facts and continuing to augment one's understanding. In the sequence we outlined, confidence (call it faith) that the mentor has wisdom and tools to impart can make the learner accept facts (on faith), secure in the psychological confidence that the mentor will explain, in time. To put it another way, the mentor/apprentice relationship can guide the learner through unavoidable boring or tough stages, toward mastery. In some way the process of learning recapitulates the scientific method. And science is hardly just the building of theories.

Enabling learning and teaching

We have called the teaching process magical and mystical; so is learning. People have taught and learned for tens of thousands of years; the biological roots of learning are older still. There is no one way to teach or learn, yet we think there are some identifiable underlying psychological principles that enable good learning:

- (1) **Empathy:** The teacher must care, and God knows it is difficult to do so when there are four classes to teach, inadequate pay, distractions diverting attention from the students, and social problems as obstacles. But the students have carefully tuned emotional antennae that detect care. And a good number respond.

³⁰. R. Hoffmann, *The same and not the same* (Columbia University Press, New York, 1995).

³¹. R. Hoffmann, B. P. Coppola, *J. Coll. Sci. Teach.* 25, 390-394 (1996).

- (2) **Active learning:** Any teaching strategy that stimulates participatory activity on the part of the student – we have stressed a variety of such – will make learning so much easier.
- (3) **Judicious interplay of groups and individuals:** Learning is a solitary action, yet it can be enhanced by episodes of group activity. Such interplay is often observed in society, for example, in the way kids master any sport (dribbling practice in soccer, a team scrimmage) or learn music through taking part in a marching band. And the group interplay at a meeting of professionals from any discipline demonstrates learning at its best!
- (4) **Empowerment:** Students love to feel capable³². We have seen countless students get hooked on studying and learning once they saw their abilities growing dramatically, through their own efforts. Anything we do that successfully empowers students will work, for they want to succeed.

We in the Academy expect students to acquire information, strategies, and critical thinking skills that allow them to learn from our teaching. There should be no less expectation that instructors think critically and seek out specific strategies to improve performance in the classroom or lecture hall. The suggestions we present here are not prescriptive; we just want to share with you some of the strategies we have improvised and developed over the years to facilitate learning for, rather than to deliver instruction to, the students we have taught. We hope that you will find them to be useful tools in your own teaching and learning.

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³². J. P. Raffini, *150 Ways to improve intrinsic motivation*. (Allyn and Bacon. New York, NY, 1995).

About the Authors

Roald Hoffmann was born in 1937 in Zloczow, Poland. Having survived the war, he came to the U. S. in 1949, and studied chemistry at Columbia and Harvard Universities (Ph.D. 1962). Since 1965 he is at Cornell University, now as the Frank H. T. Rhodes Professor of Humane Letters Emeritus. He has received many of the honors of his profession, including the 1981 Nobel Prize in Chemistry (shared with Kenichi Fukui).

“Applied theoretical chemistry” is the way Roald Hoffmann likes to characterize the particular blend of computations stimulated by experiment and the construction of generalized models, of frameworks for understanding, that is his contribution to chemistry. The pedagogical perspective is very strong in his work.

Notable at the same time is his reaching out to the general public; he participated, for example, in the production of a television course in introductory chemistry titled “The World of Chemistry,” shown widely since 1990. And, as a writer, Hoffmann has carved out a land between science, poetry, and philosophy, through many essays and three books, “Chemistry Imagined” with artist Vivian Torrence, “The Same and Not the Same and Old Wine” (translated into six languages), “New Flasks: Reflections on Science and Jewish Tradition,” with Shira Leibowitz Schmidt.

Hoffmann is also an accomplished poet and playwright. He began writing poetry in the mid-1970s, eventually publishing the first of a number of collections, “The Metamict State,” in 1987, followed three years later by “Gaps and Verges,” then “Memory Effects” (1999), “Soliton” (2002). A bilingual selection of his poems has appeared in Spanish. He has also co-written a play with fellow chemist Carl Djerassi, entitled “Oxygen,” which has been performed worldwide, translated into ten languages. A second play by Roald Hoffmann, “Should’ve,” has had several workshop productions since 2006; a new play, “We Have Something That Belongs to You,” had its first workshop production in 2009.

Unadvertised, a monthly cabaret Roald runs at the Cornelia Street Café in Greenwich Village, “Entertaining Science,” has become the hot cheap ticket in NYC.

Sandra Yancy McGuire, Ph.D., is the Director Emerita of the Center for Academic Success and Retired Assistant Vice Chancellor and professor of Chemistry at Louisiana State University in Baton Rouge, Louisiana (LSU). Prior to joining LSU in August 1999, she spent eleven years at Cornell University, where she served as Director of the Center for Learning and Teaching and Senior Lecturer in the Department of Chemistry, and received the coveted Clark Distinguished Teaching Award. She has presented keynote addresses or workshops on improving student learning at institutions such as the University of Washington, the University of California at Davis, and the University of Cape Town. Dr. McGuire is the recipient of numerous awards. In 2011, she was named a Fellow of the American Association for the Advancement of Science (AAAS). In 2010, she was named a Fellow of the American Chemical Society. In November 2007, the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring (PAESMEM) was presented to her in a White House Oval Office Ceremony. Dr. McGuire received her B.S. degree, magna cum laude, from Southern University, Baton Rouge, LA; her Master's degree from Cornell University, Ithaca, NY; and her Ph.D. in Chemical Education from the University of Tennessee at Knoxville, where she received the chancellor's Citation for Exceptional Professional Promise. She is married to Dr. Stephen C. McGuire, professor of physics at Southern University. They are the parents of Dr. Carla McGuire Davis and Dr. Stephanie McGuire.

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A Phenomenographic Study of Talented, Low-income Undergraduate Students

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Abstract

This article explores the patterns of variation in the responses of talented, low-income students engaged in a program of undergraduate study. For this article, we focused on a subset of data from an earlier study of talented undergraduate students. Our aim was to add to the literature exploring the resilience of people from impoverished backgrounds that complete an undergraduate qualification, despite challenging circumstances. The data were collected from individual interviews with 10 participants, who also completed a demographic survey. Participants had not previously been identified as talented, nor, despite their consistently high achievement, did they consider themselves to be gifted or talented. Phenomenographic analysis of the interview transcripts revealed an outcome space that explained not only what the students had experienced, but also how they had experienced it. Implications for the retention and success of such students are discussed. Although this is a New Zealand study of talented, low-income, undergraduates, our findings may have application elsewhere.

Keywords: Talented; low-income; undergraduate students; phenomenography.

A phenomenographic study of talented, low-income undergraduate students

This article reports on the findings of a subset of data related to the lived experiences of low-income students from the second phase of a study of talented undergraduate students (Millward, Wardman & Rubie-Davies, 2016). An exploratory study by Rubie-Davies et al. (2010) in New Zealand found the identification of talented undergraduate students, providing support, and tracking their retention through to completion of their undergraduate degrees and on to postgraduate study was not common practice. The lecturers at one university faculty (i.e., college) were unaware of who their talented students might be and had no planned strategy for fostering their retention or success. Rubie-Davies et al. (2010) concluded that this faculty did not appear to meet the needs of their talented students and as a result recommended a low-cost intervention strategy to support talented students (Garrett & Rubie-Davies, 2014). We completed a follow-up study to examine the lived experiences of talented students in this faculty.

The subgroup of talented, low-income students from the follow-up study was composed of 10 mature-aged, ethnically diverse, talented, low-income students studying across three sites at one university. We did not initially set out to specifically study low-income, talented, undergraduate students; however, the sample from Phase 2 of the study indicated a high representation of low-income students. Ten of the 22 interviewees (45%) self-identified as low-income students. We did not measure the income levels of our sample but rather reviewed transcripts from participants who described themselves as being poor, or living in low-income environments.

Currently there is no agreed definition of the terms gifted and/or talented. Scholars have endeavored to establish a satisfactory definition for more than a century without consensus (Subotnik, Olszewski-Kubilius & Worrell, 2011). Gagné (2009) developed a differentiated model of giftedness and talent (DMGT) that distinguished between the two terms 'gifted' and 'talented'. Gagné described giftedness as possession of natural ability in a minimum of one domain within the top 10% of learning peers. Talent, according to Gagné, emerged from the transformation of those natural abilities or gifts into developed competencies. Talent he described as having mastery of systematically developed ability referred to as reaching competency, encompassing both knowledge and skills as well as achieving within the top 10% of learning peers (Gagné, 2009).

After a comprehensive review of the gifted and talented literature, Subotnik et al. (2011) proposed a mega-model of talent development that integrated the most compelling components of already established models, and had application to *all* domains of endeavor. Subotnik et al. defined giftedness as follows: "Giftedness is the manifestation of performance that is clearly at the upper end of the distribution in a talent domain even relative to other high-functioning individuals in that domain" (p. 3). They described talents as being developmental in nature, emerging variously through childhood, adolescence or adulthood. The authors proposed that abilities matter and are developed through several transitions. Their model highlighted psychosocial, external, and chance factors having the potential to act as delimiters or enhancers to talent development (Subotnik et al., 2011).

We selected the talented label for the participants in this study because we believed the students' high academic achievement met the criteria suggested by Gagné's (2009) DMGT for talented students. The participants in our study achieved in the top 10% of their cohort across a range of diverse courses over an extended period. We also considered the developmental trajectory of the students' talents aligned with Subotnik et al.'s (2011) model.

The retention of talented low-income undergraduate students through to degree completion in the United States has been identified as an achievement trap (Wyner, Bridgeland, & DiIulio, 2007). Wyner et al. profiled 3.4 million exceptional American students and found that although low-income students entered college from high school at similar rates to their wealthier counterparts (93% compared with 98%), their completion rates differed significantly. Completion rates within 6 years, however, were only 59% for low-income students compared to 77% for their more affluent peers. Schmidt (2007) suggested it could be important for tertiary institutions to assess their programs to enhance the retention and success of talented, low-income students.

Stevenson and Clegg (2012) commented on a significant body of literature from the United Kingdom and Europe that explored how risk factors such as age, social class, gender, and ethnicity affected the transition of mature

learners into higher education. First-in-family undergraduate students from minority ethnic or low-income groups often find the transition to undergraduate studies uncomfortable and difficult (Jehagir, 2009; Soria & Stebleton, 2012; Tupai, 2010). Stevenson and Clegg noted there was little research into how these learners became focused towards their futures.

The current study addresses this research gap. Stevenson and Clegg encouraged others to employ self-authoring as a technique to further investigate how such learners become future-focused given there are compelling theoretical reasons to pay attention to participants' self-authoring (Scanlon, 2008). Scanlon utilized self-authoring to explore adult students' motives for returning to further education in Australia. The method enabled Scanlon to access participants' considerations of their prior and current life circumstances and to explore their motives for returning to education. Stevenson and Clegg (2012) saw a focus on how adult learners orientated themselves towards the future as essential in an age of riskier employment.

Universities throughout the world are recognizing that responsible efforts are required to improve educational opportunities for minority students. It is encouraging that data from international studies (e.g., Bowen & Bok, 1998; Wyner et al., 2007) has helped to dispel impressions that abilities and performance of minority students admitted to selective colleges and universities are disappointing. On the contrary, Bowen and Bok's study contained abundant evidence that minority students had strong academic credentials when they entered college, that they graduated in large numbers, and that they enjoyed successful careers and greater financial stability on completion of their college education. The authors also noted the graduating students enjoyed economic success and involved themselves extensively in a wide range of civic and community activities.

Bowen and Bok (1998) concluded that the development of personal talents through higher education opportunities paid off handsomely for individuals from minority ethnic groups and those from low-income backgrounds. They went on to explain that benefits were not just restricted to the talented low-income individuals themselves, but that additional

benefits accrued to society at large through the subsequent leadership and civic participation of graduates. Social benefits are a major justification to not merely recruit, but also to support the successful engagement and completion of talented low-income students in their undergraduate programs.

The cohorts of students that universities throughout the world are recruiting are increasingly diverse. A stated goal of several New Zealand universities is to increase the recruitment, retention, and success of ethnic

minority groups, who are identified as being at risk of underachieving educationally and financially in New Zealand: Māori (indigenous people of New Zealand) and Pasifika (individuals originating from any one of the South Pacific Islands). To this end, several New Zealand universities have developed targeted admission schemes to support students from low-income backgrounds to study at university. Hence the focus for this study was to explore the experiences of very high achieving low-income students as they progressed through their undergraduate degree programs.

Methodology

Participants

Interview data were obtained from 10 talented, low-income students. The participants were a subset of a larger sample of talented undergraduate students involved in an earlier study. The original study identified 278 students who had achieved a grade point average (GPA) of seven or higher out of a possible nine points. Seven points is equivalent to an A- average across all courses studied, whereas nine is equivalent to an A+ average. A GPA of five is more common for students from the faculty that is the focus of this study. Potential participants were identified from a cohort of 2,612 undergraduate students studying in one university faculty. The personal identification numbers of students with GPAs of 7.0 or higher were generated from the university's database. A participant information sheet and an anonymous survey requesting demographic data were mailed to all potential participants at the beginning of the 2012 academic year.

Demographic surveys were returned by 128 students (46%). An invitation to volunteer to be interviewed was included with the survey. Of those who volunteered to be interviewed ($N = 100$), 22 participants were randomly selected. Of those 22 students, 10 self-identified as being from low-income environments. These 10 students made up the sample for the current study. Demographic data for the 10 participants are displayed in Table 1. Most of the students (70% of the sample) were from ethnic minority groups traditionally identified as underachieving educationally in New Zealand. All were from low-income environments and were mature-aged parents with childcare responsibilities.

Table 1: Demographic characteristics of the sample.

Ethnicity	Sex	Dependent children	University entry qualification	Income status
Maori	Female	Yes	No	Low
Pasifika	Male	Yes	No	Low
NZ European	Female	Yes	No	Low
Maori	Female	Yes	No	Low
NZ European	Female	Yes	No	Low
Maori	Female	Yes	No	Low
NZ European	Female	Yes	Yes	Low
Maori	Female	Yes	No	Low
Maori	Female	Yes	Yes	Low
Pasifika	Female	Yes	No	Low

Phenomenography

Phenomenography, a qualitative methodology, was selected because it provides a theoretical framework that enables the researcher to consider different ways people experience and understand phenomena (Harris, 2008, 2011; Martin et al., 2001; Ornek, 2008). This methodology enabled us to generate an in-depth understanding of the talented, low-income students' undergraduate experiences.

This theoretical research framework was developed to answer questions about thinking and learning (Marton, 1986). In phenomenographic research, the focus is on *how* people experience phenomena rather than a study of phenomena (Ornek, 2008). Phenomenography provides a means to demonstrate the collective meaning of shared experiences, because different people experience phenomena in different ways. Phenomenographers attempt to describe phenomena as understood by participants, rather than imposing the researcher's view on data. Instead of attempting to find the singular essence of a given phenomenon, it is the variation and the structural relationships of the different aspects of the phenomenon that are sought (Walker, 1998).

Phenomenography differs from phenomenology and ethnographic research methods because of its analytical emphasis on the *structural* relationships within the data (Martin, 2004). The range of experiences are described in words by participants and then mapped onto a two-dimensional matrix or outcome space by the researcher. The participants' expressions of their experiences are referred to as categories of description (Martin, 2004). The two dimensions of the matrix describe (a) *what* is focused on by participants and (b) *how* what is focused on is experienced. The mapping exercise enables the researcher to present a hierarchy of understanding of the phenomenon (Harris 2008, 2011; Marton & Booth, 1997). The focus is on what and how different experiences are represented. The researcher is looking for differences among the participants' descriptions of the phenomenon. The result is an in-depth picture of the participants' thinking and feelings associated with each category of analysis (Martin et al., 2001).

Semi-structured interviews with a small sample of participants are the preferred method for collecting data for phenomenographical analysis. The aim of the interview is for participants to reflect on their experiences of the phenomenon and then relate those experiences to the interviewer in such a way that both come to a mutual understanding about the meanings of the experience (Martin, 2004; Ornek, 2008). The talented low-income students involved in this study had varied undergraduate experiences. It was important the researchers were neutral to the ideas of the participants and so the researchers had to make their personal feelings and beliefs explicit, by bracketing preconceived ideas before analyzing the data (Martin, 2004; Orneck, 2008).

Procedure

Semi-structured interviews lasting approximately 60 minutes were carried out with each participant. The interviews were conducted by one of the researchers who did not teach on the program and included three interview prompts. These were as follows: (a) Tell me a little about your history that you think might be relevant to this study; (b) What single factor has contributed most to your academic success; and (c) Explain your feelings on being informed of your selection for participation in a study of talented students. The interviews were audio-recorded and transcribed by a contracted transcriber who had signed a confidentiality agreement.

Data analysis

Phenomenographic analysis is an iterative process that involves repeated sorting and resorting of data. The ongoing comparisons between the data and developing categories or themes of description are necessary. A number of steps are involved in the analytical process. We used the seven-step process identified by Sjöström and Dahlgren (2002) for this analysis. The process used is explained below.

- Step 1: Familiarization. This step requires researchers to familiarize themselves with the data by reading the interview transcripts and making any necessary corrections. The 10 transcripts were reviewed and edited by the researcher who carried out the interviews. She listened to each audio-recording and corrected any transcription errors.
- Step 2: Compilation of answers to specific prompts by the different participants. The most significant element in each answer was identified and the elements for all 10 participants placed on an interview matrix (see Table 2 for an extract of the matrix related to responses to one interview prompt).

- Step 3: Condensation or reduction of the individual responses. This was carried out to find the central element of a dialogue.
- Step 4: Preliminary groupings or classifications of similar answers.
- Step 5: Preliminary comparison of the categories.
- Step 6: Naming categories.
- Step 7: Contrastive comparison of categories. This involved describing the character of each category and the similarities between categories.

Table 2: An Excerpt from the Interview Matrix for Question 6

Interview	#2	#8	#13
Q6. How did you feel when you were invited to participate in this study?	Took me by surprise. Don't consider myself gifted. I really enjoy then challenge of uni[varisty] work. I don't want to be seen as a nerd.	Shock. I never believed I would do well. Pride but shock.	Surprise! I sort of laughed about it at first. I thought Okay I don't think I've reached my full potential.

This process of analysis enabled us to reduce the complexity to a conceptual framework that showed how the various elements might be connected. Through this process, we developed initial categories that described different participants' experiences as talented, low-income undergraduates. After identifying multiple aspects of the students' experiences of the phenomenon, we developed categories that explained all the variations in their responses. We then re-examined the transcripts to make sure the categories were sufficiently descriptive of the data. A process of review and modification continued until the modified categories appeared consistent with the interview data. The first and second authors independently coded six of the transcripts using the agreed themes. Codes were allocated to each relevant line of transcript. The coding of the six transcripts was compared and any instances of ambiguous coding discussed by the researchers until agreement could be reached on the most appropriate coding. The first author then coded the remaining transcripts. Quotations from the transcripts have been used to illustrate the findings, because these have been taken verbatim, the excerpts may not always be grammatically correct. Through this analytical process, we strove to describe how talented, low-income students viewed the lived experience of their undergraduate studies.

Results

Our phenomenographic analysis indicated an outcome space with four categories of description (see Table 3). These categories described the lived experiences of the participants as they transitioned into their undergraduate programs and subsequently experienced high levels of academic achievement, resulting in an invitation to participate in this study. The talented low-income undergraduate students came from *disbelieving* perspectives.

Table 3: Four categories of description mapped on an outcome space.

What is focused on					
How what is focused on		Prior experience	Recruitment	Program participation	Qualification completion
	Disbelieving	1			
	Engaging		2		
	Believing			3	
	Challenging				4

Once enrolled in their current program, however, they found themselves *engaging* more deeply than anticipated. As the students began receiving high grades for coursework they started *believing* in their capabilities. Success gave the students the confidence to start *challenging* themselves, to constantly seek high levels of achievement. The lived experiences of the 10 participants are presented under these subheadings.

Category 1: Disbelieving

When participants were asked how they felt about being identified as talented students and invited to participate in our study, their responses differed. Although they were gratified to have been identified among the top 10% of achievers in the faculty, there was an overwhelming response of surprise. Typical responses included “shocked,” “surprised,” “anxious,” “pretty happy,” and “proud.” All of the participants had grown up in challenging, low-income environments and had experienced limited success during their periods of compulsory education. The 10 students had all entered university as mature-aged students, eight of them via the university’s special admission pathway. This pathway waives the regular university entrance requirements for applicants who are over the age of 20 and are New Zealand citizens or permanent residents.

Some of the participants described, in vivid detail, their harrowing childhoods. Three students talked about frequent experiences of domestic violence. One recalled strategies she employed to help her deal with the violent world she grew up in:

So how did I deal with domestic violence? I enjoyed reading and that may have been a way of me escaping and strengthening my inner world, so I could deal with life around me (Interview 5).

For some participants, the cycle of family violence followed them into their adult life. One tearful participant stated:

When I first started [at university] my sister-in-law was murdered. Her partner beat her to death. I was having a bit of trouble at home studying and me and my partner had domestic things happen (Interview 13).

Many of the students spent periods of their childhood living with adults other than their parents. Some moved frequently between family members, requiring them to often change schools. One participant attended 17 different schools. Students who lived with parents talked about how hard their parents worked to provide for them. One student, the youngest child in his family, whose mother was a solo-parent explained:

We were living out [a low socio-economic area], from a broken home; my mum was working three jobs to keep payments up on the mortgage, food on the table, looking after schooling for my elder siblings and helping them out through their challenges. Mum thought that it was just too hard to get me out there as well (Interview 3).

All participants described their formal educational experiences as challenging. Their enjoyment and achievement at undergraduate level was in stark contrast to their compulsory schooling experiences. One participant recalled:

I hated school and I had a terrible time at school. I was told I was thick at school. So hence I’ve never done anything with my life because I believed them [teachers] (Interview 8).

Participants commonly talked about hating school, bunking [playing truant], being bored, leaving school as soon as possible, and occasionally being bullied by peers for appearing more able than their peers. These students quickly learnt to hide their talents so they could merge in with their less able peers. Three participants left school because they were pregnant and were then immersed in childcare responsibilities. Others had attempted courses after leaving school but had not completed them. None of the talented low-income students discussed enjoying studying or successful careers prior to entry into their undergraduate courses.

Category 2: Engaging

The decision to embark on a three-year undergraduate course required commitment. One participant was caring for several of her siblings as well as her own three children. One was caring for her elderly mother and her teenage daughter. All of the participants were still living in low-income environments. Three had applied for and won scholarships that covered their course fees and living costs. Two of the scholarships were for fluent speakers of Te Reo (the Māori language). The other students had been able to access interest-free loans to cover their study costs, as well as a living allowance, from the New Zealand government. Without these financial supports none of the students

would have been able to entertain embarking on a three-year degree program. Even with these financial supports, most participants worked part-time to supplement the household income. Six of the 10 participants were studying at a satellite campus some distance from the main campus. The availability of the university program in their local communities enabled these students to consider studying at the undergraduate level.

Despite their challenging circumstances, the students, without exception, talked enthusiastically about how much they enjoyed engaging in their undergraduate studies. Typical comments included, "I'm loving it," "It's been fantastic," "I'm really enjoying studying," "Yes, I've enjoyed my learning journey so far," and "It's been a great experience." One participant explained how she felt daunted initially: "My first week at uni[versity] I came home and cried every night, but after the first few weeks I just loved it" (Interview 12). Another participant commented: "I'm really enjoying studying, getting quite addicted to it" (Interview 13). Interestingly these students found the more academically challenging courses particularly engaging.

Category 3: Believing

As the students engaged with their courses they started to read more widely, they attended all lectures and tutorials and invested significant time and effort in their studies. They gradually came to the realization that they could be successful. Typical responses included: "I work hard. I'm doing a lot better than I anticipated" (Interview 3). Another student commented:

I didn't really know what I was walking into. I was willing to take this journey and see where it would lead me. I made a pact with myself I would do my best. I've mostly had A+ (Interview 4).

A common theme was a realization that if the participants put effort into their studies, they would reap the rewards. One student summed this up saying:

I just work hard; I put in a lot of hours; I work so hard to get good grades; I work really, really hard (Interview 8).

The participants' lives were more complicated and challenging now than when they were at school. One student told us how her dream of achieving her career goal had been 14 years in the making. At the age of 17, she worked as a support person to the professionals in her chosen career and that opportunity prompted her future aspirations, but she became pregnant and so had to delay her plan. Four children later and her life became even more complicated when her husband's leg was amputated as the result of a work-related accident.

Many participants worked part-time, some up to 25 hours per week. For one student her day began at 5:30am attending to her family. She also worked as a cleaner and dishwasher late into the evening, finally returning home to attend to her family's needs before she could make time for her own studies, usually after midnight. Other students reported studying into the early hours of the morning. They believed that if they worked hard they would achieve their degrees and achieving their qualification had the potential to change their lives. Participants frequently commented that they tried so hard because they wanted to be successful for their children. One student summed up the sentiments:

I want a better life for my kids. I try hard because I want to be successful for them. I want to have a better life and help my family (Interview 17).

The participants saw education as the key to future success and financial security for themselves and their families, and they now believed they could achieve it.

Category 4: Challenging

With a new found belief in their capabilities came the confidence to challenge themselves, their lecturers, and their peers. The students constantly challenged themselves to maintain or better their grades: "I'm not satisfied with B grades. Year 1 was a shock, so from that moment I decided not

to spout crap” (Interview 2). Another explained how she expended additional effort to maintain her high grades:

I just work hard and research. So if we’ve got required readings for an assignment, I also do the recommended readings. I’m always looking for other recommended readings. I do a lot of preparation. I overwrite essays. For a 2,000 word essay I can write 5,000 [words] and then chop it back. I’ll write that three times. I work really, really hard (Interview 8).

One student was not impressed when she received a grade lower than she anticipated for an assignment. She commented:

When I got to [lecturer’s] class I didn’t get away with anything. She knocked it on the head right there and said, no, this is the standard and you haven’t met it, and this is what you need to do. So soon as I got C+ I was like, are you serious? She gave me practical feedback and feed-forward and I took it on board and I smashed the next essay. I went from C+ to an A” (Interview 22).

Students commented that they did not like lecturers making course work easy. They preferred to be challenged to engage with new information, to make links with their prior learning and apply knowledge to new situations. One Pasifika male student commented:

I love challenges. I like to be uncomfortable with new information and try to find ways to apply it, to give it context. I don’t like it [spoon feeding]. It just doesn’t make sense to me to be given all the information you need. I like to work for it. I would say about 40% of the work that we have is spoon-fed. This year [second year] it’s been a bit better, it’s been about 30 to 25%. One paper in particular has been very easy. I would be surprised if anyone was to fail that paper (Interview 3).

One of the talented Māori students also described how she was frustrated when lecturers made the content too easy:

I was really serious about being challenged. I like to work them [problems] out for myself. No, I said to her, I was serious about being challenged and she just sort of laughed, because yeah that [lecture content] was pretty basic (Interview 13).

The students had achieved grades that made them eligible to apply for postgraduate study on completion of their undergraduate degrees, and this opened up new horizons for them.

Discussion

The aim of this study was to research the lived experiences of talented students as they transitioned into and through their degrees. For this article, we focused on a subgroup of low-income participants. A phenomenographic approach revealed how the participants experienced their learning journeys and gave us a deeper understanding of their lived experiences as they overcame challenging delimiters and maintained an A grade GPA across all their courses..

Talent trajectories of low income students

Our participants consistently achieved in the top 10% of a cohort of 2,612 undergraduate students; thus, they clearly met Gagné’s definition of giftedness. Their high levels of academic success were relatively recent, however, as none were particularly successful at school and most entered the university via its special admissions pathway. Subotnik et al.’s (2011) description of talents being malleable and having a developmental trajectory thus applied to this sample of participants. Our findings demonstrated the developmental trajectory of the 10 participants’ talents, illustrating that these students were able to overcome previously experienced delimiters and instead capitalize on psychosocial and chance enhancers that fostered rather than restricted their talent development (Subotnik et al. 2011).

Barriers to talent development for low-income students

The literature relating to first generation students’ academic engagement and retention (e.g., Soria & Stebleton, 2012) has highlighted the retention and engagement issues experienced by first-generation undergraduate students. The 10 students in our sample all experienced the risk factors

described by these authors, yet somehow they were able to demonstrate the resilience and persistence required to successfully engage in a degree program. They were as Scanlon (2008) described both past- and future-focused.

Given this change, we wondered, “What had changed for these students?” They were still living in low-income environments. Their lives were more complex now, as they all had family responsibilities. Some had experienced personal traumas and challenges, yet here they were achieving to very high standards and enjoying their academic studies. The talented, low-income students in this sample still had significant barriers to overcome, in order to reach their lofty educational goals. These participants were still experiencing financial hardship. None had sufficient income to pay study fees without the support of a scholarship or a government subsidy. Most of the participants engaged in paid employment to supplement the family income, restricting their time for independent study. If we could identify what caused the change in their achievement trajectories, perhaps we could implement an intervention strategy that might support others’ achievement.

The heart-rending stories revealed by the participants, highlighted the need to make undergraduate programs accessible and achievable. These successful students knew what it was like to live in a world of failure and disappointment. They had succeeded and had the potential and passion to be able to make a difference to others from similarly disadvantaged backgrounds. Through their self-authored explanations we were able to see how past experiences provided motivation for future-focused endeavors (Scanlon, 2008). Without exception, these students wanted to be role models for their children. They described their prior and current life circumstances as well as their focus on an improved future. Some talked about their motivation to engage in higher education as *unfinished business*. The majority of our participants had exited school early without gaining formal qualifications. They all held dreams of better lives for themselves and their families, thus they were all now future-focused (Stevenson & Clegg, 2008).

Although all participants recalled their school experiences as unsatisfactory, they now saw education as their gateway to a better life for themselves and their families. Our findings concur with those of Scanlon (2008) who found negative formative education experiences had an impact on adults, and that in order to progress, they needed to “remove blocks to learning created by earlier experiences” (Scanlon, 2008, p29). Motives situated in our participants’ lives at a particular time were powerful enough to enable them to take the first step towards their future-focused dreams and apply for entry into an undergraduate program. Their retention in the program, however, appeared to be influenced by their strong academic achievement, as well as a newly found love of learning that enabled them to embrace the challenges they encountered on their undergraduate learning journeys. The participants in this project appreciated the invitation to participate in a study of talented students. Although they expressed surprise at their eligibility, they were pleased and proud that their strong academic achievement had been recognized, especially given their previous negative experiences in academic institutions.

Recommendations

Our study suggested that the test scores of mature students who were unsuccessful at school may be poor predictors of their ability to succeed at undergraduate level. Furthermore, the maturity and life experiences these students brought to their studies may have provided motivation for educational success. It is recognized that low-income students may be underprepared educationally, but we contend that they have greater insight into the lived experiences of students from similar environments. Talented students who move into such professions as teaching, engineering, medicine, or law have the potential to make a significant difference to children growing up in similar low-income environments. They have experienced negotiating the unfamiliar labyrinth of academia and can help to bridge this gap for their students and their families. They are insiders.

Recognition of their strong achievement appeared to be an important motivator for these students. The faculty involved in this study had previously focused on the identification and support

of underachieving students, but not of high achieving students. The interviewees all expressed pleasure at the recognition of their achievements, as this was not something they had previously experienced. The participants received a personal letter congratulating them on their strong achievement and an invitation to a morning tea where they could meet other high achieving students. This provided opportunities for them to network with other similarly driven individuals. The participants were also invited to attend professorial lectures and presentations by visiting academics. These invitations had previously been restricted to postgraduate students. These simple cost-effective strategies were greatly appreciated by the participants. We encourage other institutions to consider recognizing their talented students in similar ways.

The greatest barrier these talented, low-income students faced was entry to undergraduate programs, given their lack of university entrance qualifications from secondary school. Several strategies facilitated this access. The first was the location of the degree program in their local area. Although it is not always possible for universities to re-locate programs, several students commented that if they had had to travel to the main campus, then university study would not have been an option they could have considered. The second was the special entry requirement that enabled them to enroll in their desired program without meeting the usual university entry requirements. As only two students earned a university entrance from school, the eight other capable students would have been denied access. The third was the provision of interest-free loans to cover course expenses, living allowances for students from low-income backgrounds, and for three participants, scholarships that provided additional funding. If we are to encourage capable mature students to consider further education opportunities then the provision of scholarships seems to be a strong motivator, not only for enrolling but for also maintaining participation.

The final suggested strategy is for universities to consider the difficulties mature students with childcare responsibilities encounter, when developing their timetables. These mature students discussed the additional challenge of attending to the needs of their families while studying. Scheduling classes during school hours was reported as greatly assisting students' ability to attend lectures. Making course materials available electronically also meant students could engage with course content at their convenience, which was often in the early hours of the morning. Many universities are utilizing blended models of delivery providing more opportunities for students to engage with learning activities at times suitable for them. In the case of low-income students however, connectivity to the internet and access to such online resources may be an issue.

Limitations and conclusion

There are limitations to this study. The sample size was small and relied on voluntary participation. These characteristics limit the generalizability of our findings (Gay & Airasian, 1992). The participants in the study may have been more motivated to take the opportunity to share their stories (Marsh & Dunkin, 1992), than students who did not experience such challenging learning journeys. Despite these limitations, this study highlighted interesting findings that we believe are worth further investigation by other universities both in New Zealand and in countries experiencing similar issues with low-income groups identified as underachieving educationally.

In conclusion we were surprised at the number of low-income students identified in our talented student study, particularly as these students had not been successful during their period of compulsory education. Our findings showed that these students could be highly successful in an academic environment due to their commitment and engagement. It is important for both social and economic reasons that the learning and achievement of capable students from low socioeconomic backgrounds is supported and nurtured so that such students can become role models for their communities.

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The Strengths, Needs and Vulnerabilities of Gifted Employees

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Abstract

The abilities of gifted employees are extremely valuable in a knowledge based economy. However, research on the functioning of gifted adults in the workplace is relatively scarce. In this study we focus on the strengths and needs of gifted employees and investigate how well these fit with their current job. We also explore which barriers may hinder gifted adults at work. The results are based on two online surveys (N = 48 and 35 respondents respectively) and biographical data. This study shows that gifted employees stand out because of their high cognitive abilities, strong willpower and creative drive. They are eager to solve complex problems and would like to allocate nearly 85% of their time to non-routine tasks. However, in reality many feel bored and experience a big gap between their intrinsic capabilities and the current requirements of their job (~ 80%). Unsuitable job contexts may lead to the desire to change jobs (~ 70%) and bore outs (~ 50%). On the other hand, gifted workers are also prone to workaholic behavior and burn-outs (1/3 respondents), because of the very high standards they set for themselves (and others). They may also suffer from emotional distress because of the 'intellectual disconnect' they experience with colleagues.

Keywords: Gifted adults; gifted employees; gifted traits; pitfalls; job satisfaction; bore out; burn-out.

Introduction

Today, more and more emphasis is placed on educational provisions for gifted children (e.g., see Heller, Mönks, Sternberg, & Subotnik, 2000). Gifted children typically show an enhanced capacity to learn and tend to be more mature than their age mates. They have a huge thirst for knowledge and are very curious by nature. Because of this, gifted children have different needs than the mainstream children in school (Rogers, 2007). When the curriculum is not enriched or moves forward at a too slow pace, gifted children tend to get bored or malcontented, which in the worst case may lead to (severe) underachievement or an aversion to school (Kanevsky, & Keighley, 2003). Boredom may also lead to behavioral problems or to stress-related complaints and depression (Merrotsy, 2013). Gifted children are also vulnerable to potential pitfalls such as fear of failure and unrealistic goal setting (Kieboom, 2015). Therefore gifted children, just like any other children, need the guidance from parents and educators to grow up to happy and balanced individuals.

Many schools around the world acknowledge the specific needs of gifted children and provide educational interventions that allow them to match the level of complexity of the curriculum with the (cognitive) abilities, readiness, and motivation of the gifted child. Interventions can range from compacting the curriculum and replacing it with challenging assignments, to grouping gifted children with alike peers, or accelerating the most advanced children by grade-skipping etc. (e.g., see Colangelo, Assouline, & Gross, 2004; Heller et al., 2000). Long-term studies have demonstrated the positive effects of these interventions on the wellbeing of gifted children (e.g., see Lubinski, 2004; Lubinski, Webb, Morelock, & Benbow, 2001; Park, Lubinski, & Benbow, 2013).

But what happens when gifted children grow up and become gifted adults? Giftedness is not something that children will outgrow once they reach adulthood (Fiedler, 2012; Jacobsen, 2000). Giftedness is an inherent part of someone's personality, so it can be assumed that the same needs and pitfalls will still be present in gifted adults. However, research on gifted adults and their performance at work is scarce (e.g., see Corten, Nauta, & Ronner, 2006; Nauta, & Corten, 2002; Nauta, & Ronner, 2008, 2013; Persson, 2009; Ronner, & Nauta, 2010; Siekanska, & Sekowski, 2006; van der Waal, Nauta, & Lindhout, 2013). This is surprising, because gifted people, because of their intrinsic gifted

traits, could play a vital role in our current economy which is mostly driven by knowledge, innovation and technological advancement (Corten et. al, 2006; Shavinina, 2009a).

The current study is part of a bigger research project in which we try to understand the specific strengths and needs of gifted employees and explore the major roadblocks that hinder them in their careers. We also investigate to what level their job matches their intrinsic capabilities and how this impacts their job satisfaction. From a research point of view these questions are still largely unexplored. In the discussion we also provide some helpful tips for supervisors of gifted workers.

Material and Methodology

Limitations of working with gifted adults

Giftedness can be formally ‘diagnosed’ using a valid IQ test. However, the majority of gifted adults refuse to take an IQ-test or feel reluctant to admit that they are gifted (Fiedler, 2012; Jacobsen, 2000; Kuipers, 2007). Some were underachievers at school and will deny all obvious signs of giftedness. Others believe that they have outgrown their childhood giftedness or even question the results of an IQ-test. Also negative experiences during childhood may inhibit gifted adults to show their true nature. When working with gifted adults, it is therefore important not to focus only on intelligence or the numerical findings of an IQ-test, but also on the ways in which giftedness manifests itself in everyday life (Jacobsen, 1999, 2000).

At our expertise center “Exentra” we have helped > 6000 gifted clients over the last 18 years. From thousands of in-depth coaching sessions we have learned that many parents recognize themselves as being gifted through the typical traits shown by their gifted children. These include both cognitive (high intelligence, creativity, etc.), and non-cognitive components of giftedness (feeling different, strong moral sense, etc.) (Kieboom, 2015). In this study we included both adults who scored in the top 2% of a valid IQ-test, and adults who were not officially tested, but recognized themselves as being gifted through the typical signs of giftedness shown by their children.

Research design

The current study is an exploratory study in which no control group of non-gifted adults was included. The results are based on two separate online surveys (designed with Qualtrics Survey software), combined with testimonies from gifted clients. The testimonies are “masked” so that the content is unrecognizable to third parties. The first survey was part of a bigger research project on gifted employees in Belgium funded by ESF (European Social Fund). The second survey resulted from a discussion forum in Antwerp (Belgium) on the manifestation of giftedness in children and adults. All the respondents consented on paper that their contribution could be used anonymously for scientific research. The participants came from various age categories, and gender, educational and professional backgrounds.

We collected 48 valid responses in the first survey, and 35 in the second survey. Seven (= 15%) participants in the first survey were tested via a valid IQ-test, the other 42 (= 85%) were not officially tested, but recognized themselves as being gifted. In the second survey, the proportion was 22 (63%) tested over 13 (37%) non-tested participants. The first survey contained a list of 95 statements that had to be scored on a 5-point Likert-Scale ranging from ‘not at all like me’ to ‘very much like me’. The second survey contained 20 similar matrix statements, combined with questions that had to be scored on a scale of 0-100%.

In both questionnaires, we also included general questions on education and job context, and a number of “open questions” where respondents could elaborate on their personal experiences. The most prominent findings of these surveys are presented in this article. Due to the small sample sizes, non-parametric tests were used for the statistical analysis of the data (using SPSS).

Results

Manifestations of giftedness

The findings in Table 1 show the manifestations of giftedness to which the respondents in this study could primarily relate to (n= 48). (i) *High intelligence*: The majority of respondents recognized themselves as “rapid thinkers” (96%) and “quick analyzers” of new information (98%). They could easily link concepts of different domains (95%) and reason in great depth at different levels (95%). The majority also claimed to have multiple interests in different fields (95%). (ii) *Motivation*: Around 95% of the respondents indicated that they become very passionate and focused when subjects capture their interest. They also feel the urge to advance quickly in their job (96%) and become the best in whatever they undertake (90%). (iii) *Creativity*: Around 90% of the respondents indicated that they think independently from others. They are good in defining new concepts and ideas (77%), and consider themselves as creative problem solvers (~90%). 98% of the respondents said that they are always looking for possibilities to improve or to optimize.

Table 1: Manifestations of giftedness to which gifted employees could mostly relate. The total percentage of responses in the categories “more like me” and “very much like me” are given, together with the means (\pm *SD*) on a scale of one (not at all like me) to five (very much like me).

Manifestations of giftedness		Total %	Mean \pm SD (n= 48)
HIGH INTELLIGENCE	I can quickly analyze information.	98%	4.48 \pm .54
	I am a rapid thinker.	96%	4.52 \pm .58
	I can reason at many different layers at the same time.	95%	4.46 \pm .76
	I can easily link concepts from different domains.	95%	4.49 \pm .76
	I have many different fields of interest.	95%	4.62 \pm .75
MOTIVATION	I am very enthusiastic about my passions.	97%	4.73 \pm .60
	I like to advance quickly in my job.	96%	4.46 \pm .58
	I can deeply concentrate myself on subjects that interest me.	94%	4.52 \pm .74
	I like to be the best in whatever I undertake.	90%	4.40 \pm .73
	When I start something new, I want to know everything about the subject.	81%	4.19 \pm .78
CREATIVITY	I am always looking for possibilities to improve or to optimize.	98%	4.40 \pm .53
	I always see different solutions for a problem.	92%	4.22 \pm .81
	I like creative solutions.	89%	4.43 \pm .95
	I think independently from others.	89%	4.24 \pm .91
	I am good in putting forward creative ideas and concepts.	77%	4.00 \pm .74

Unexplored potential of gifted employees

The results in Table 2 illustrate that $\geq 77\%$ of the respondents (n = 35) experience a big gap between their intrinsic capabilities and the current requirements of their job. They regularly feel very bored at work and may start looking for a new job because of this. This is clearly illustrated by the following two testimonies:

Marc is working as a Global Account Manager for a big pharmaceutical company. Senior management is very happy with his performance, but Marc feels uncomfortable because he realizes that there is a big gap between his true potential and his actual output at work.

“It feels very demotivating”, Marc says, “that people praise my performances, while it feels to me as if I am just “walking on the edges”. My true potential lies miles away from what is expected from me in my job and it feels as if I am constantly “driving with my brakes on, as if I am always waiting and waiting and waiting for others”...

Table 2: Gap between the potential of gifted employees and what is required from them at work. The total percentage of responses in the categories “more like me” and “very much like me” are given, together with the means ($\pm SD$) on a scale of one (not at all like me) to five (very much like me).

‘Unexplored’ potential of gifted employees	Total %	Mean \pm SD (n = 35)
I have much more potential than what is required from me at work.	80	3.97 \pm 1.15
Not all my capabilities are “used” at work.	77	3.83 \pm 1.62
I regularly feel very bored at work.	77	3.89 \pm 1.08
I always reach the point where I will become bored and start to look for a new job.	71	3.86 \pm 1.17
I often have the feeling that I need to work with 'my breaks' on.	60	3,51 \pm 1.15

The feeling of being held back by others is also familiar to Ann. Ann is working as an HR Manager in an international banking company. She is a successful and well-respected employee, but she is obliged to adjust herself to the (much lower) expectations of others and stay within the ‘boundaries of her job’.

“I often feel very bored and frustrated at work, but I have learned to keep myself busy with other things. The fact that I always have to hide my true potential really drains my energy. Sometimes it becomes so demotivating, that I feel the desire to look for another job”...

Needs of gifted employees

The findings in Table 3 show the most common “needs” of the participants in this study (n= 35). 94% of the respondents indicated that they have a great hunger for knowledge, and feel very driven when they can work on challenging projects. The majority truly dislikes repetitive tasks (78%). 77% of the respondents said that they enjoy collaborating with peers with the same “level of thinking”, but they also need autonomy in their job. When asked how it feels to work on challenging assignments, the participants answered that it makes them feel “*euphoric, very motivated and curious, in the zone, recognized, as if all their senses revive*”! One participant described it “*as if the lights are finally turned on in my head, as if I finally wake up*”. Challenging tasks also seem to stimulate their creative mind: “*New ideas well up day and night, 24 hours around the clock*”.

Table 3: What gifted employees need the most at work. The total percentage of responses in the categories “more like me” and “very much like me” are given, together with the means ($\pm SD$) on a scale of one (not at all like me) to five (very much like me).

Needs of gifted employees	Total %	Mean \pm SD (n = 35)
I have a great hunger for knowledge.	94	4.74 \pm .56
I feel very driven when I can work on challenging assignments.	94	4.51 \pm .70
I truly dislike repetitive tasks.	78	4.11 \pm 1.18
I feel very motivated when I can collaborate with other gifted people.	77	4.20 \pm .80
I prefer to work autonomously.	77	4.03 \pm 1.15

Challenging assignments

The need for autonomy and challenging assignments is further illustrated in Figure 1. Gifted employees significantly prefer tasks for which they have “carte blanche” (Mean \pm SD = 90.14% \pm 12.26), creative, innovative tasks (Mean \pm SD = 84.83% \pm 14.67) and non-routine tasks of high difficulty (Mean \pm SD = 78.09% \pm 19.04) over strictly defined tasks (Mean \pm SD = 33.03% \pm 22.40), non-routine tasks of normal difficulty (Mean \pm SD = 50.34% \pm 22.09) and routine tasks (Mean \pm SD = 27.46% \pm 26.49) (Kruskal-Wallis test: H (5) = 133.06, $P < .0001$).

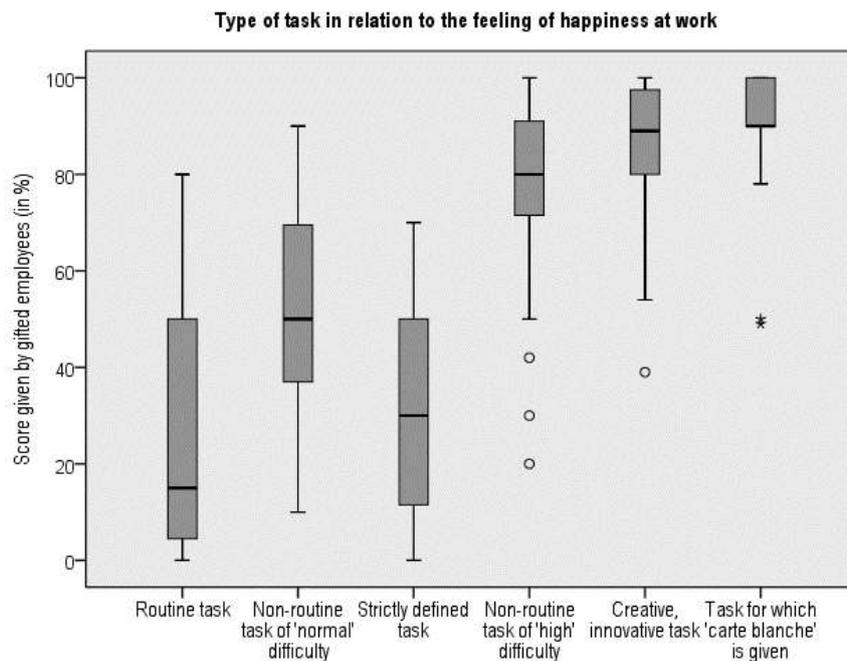


Figure 1: Box-plot illustrating the scores given by gifted employees to different types of tasks on the work floor in relation to their feeling of happiness at work (100%= “it makes me very happy”).

Ideally, gifted employees would allocate on average 59.17% ($SD = 22.73$) of their daily worktime to challenging tasks for which their brains need to work “at full speed”, 24.14% ($SD = 16.48$) of their time to the more easy, non-routine tasks, and only 16.69% ($SD = 14.15$) of their time to routine tasks which they can perform on “automatic pilot” (Figure 2). The preference for challenging assignments was significant (Kruskal-Wallis test: $H(2) = 53.11, P < .0001$).



Figure 2: Box-plot illustrating how gifted employees would ideally allocate their daily work time to different types of tasks on the work floor (100% = “I would devote all of my time to this task”).

When they would have to install a new process on the work floor, gifted employees would feel most energized during the starting up phase, when the process needs to be designed ($Mean \pm SD = 81.26\% \pm 18.58$) (Figure 3). They also like the implementation phase, when still a lot of obstacles have to be overcome ($Mean \pm SD = 74.09\% \pm 16.06$). During the optimization phase, when the process needs fine-tuning, their interest slightly starts to drop ($Mean \pm SD = 64.94\% \pm 20.52$), but they mostly dislike the maintenance phase, when the process is up-and-running and only daily problems need to be tackled ($Mean \pm SD = 27.63\% \pm 20.52$). The difference in energy level between the maintenance phase and the other phases in the process was significant (Kruskal-Wallis test: $H(3) = 61.22, P < .0001$).

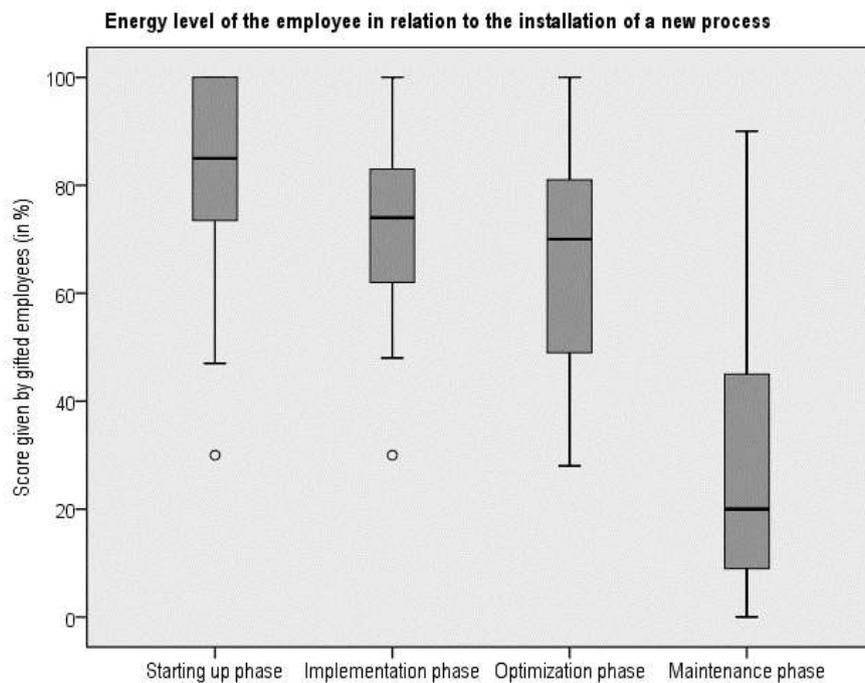


Figure 3: Box-plot illustrating the level of energy gifted employees feel in relation to the different phases of the installation of a new process (100% = “I feel much energized”).

Potential pitfalls of gifted employees

Many gifted adults are enthusiastic, respected employees, with thriving careers. However, they are also prone to potential problems, which may lead to dysfunctional behaviors and emotional distress (Table 4).

Intellectual disconnect

The majority of respondents claimed to experience a substantial difference in speed of thinking compared to their colleagues (83%). They feel as if others slow them down (81%) or do not understand their concepts and ideas (77%), and they easily see the gaps in the proposals of others (77%). This “intellectual disconnect” may be the ground for many frustrations on the work floor as is illustrated by the following example.

Steven is working as a construction engineer. When new projects are proposed, Steven can almost instantly envision the obstacles that the team will have to face. “My problem is that too many thoughts are spinning around in my head when I try to explain my objections. My colleagues then blame me for seeing ghosts and for always running ahead of the facts. I only want to help the team, but my advices are usually ignored and the predicted problems become reality. It feels so frustrating that nobody ever seems to listen to me and see me as a threat. I often just give up and withdraw myself mentally from the team”.

Table 4: Potential pitfalls of gifted employees. The total percentage of responses in the categories “more like me” and “very much like me” is given, together with the means ($\pm SD$) on a scale of one (not at all like me) to five (very much like me).

Potential pitfalls of gifted employees		Total %	Mean \pm SD (n = 48)
INTELLECTUAL DISCONNECT	I feel like I am always “thinking five steps ahead” of my colleagues.	83	4.17 \pm .90
	I feel like I always have to wait for my colleagues.	81	3.92 \pm 1.10
	I quickly see the gaps in the proposals of others.	77	3.88 \pm .70
	Others do not understand my ideas, proposals or solutions.	73	3.49 \pm 1.00
VERY HIGH STANDARDS	I am very demanding for myself.	100	4.76 \pm .43
	When I start something new, I want to be an expert right away.	98	4.63 \pm .53
	Inefficiency makes me very annoyed.	90	4.29 \pm .89
	I am very demanding for others.	81	3.89 \pm 1.01
	Fear of failure is a familiar feeling.	73	3.86 \pm 1.28
OVERDRIVE <i>versus</i> BORE-OUT	I always do more than what is expected from me at work.	95	4.38 \pm .75
	I easily turn into a “workaholic” when I am interested in a project.	75	3.96 \pm .93
	I often take over the work of colleagues, because their work does not meet my own standards.	48	3.35 \pm .99
	I regularly suffer from bore-outs because I am not challenged at work.	49	3.00 \pm 1.25
	I alternate periods of overdrive, with periods of burn-outs.	33	2.71 \pm 1.34

Very high standards

All gifted employees in our survey consider themselves as very demanding (100%): when they start something new, they want to be an expert right away (98%), leaving very little room for errors and mistakes. They are also very demanding for others (81%), and may become very annoyed when things do not go smoothly and well (90%). This tendency to set very high standards for themselves and others, may lead to fear of failure ($\frac{3}{4}$ of the respondents) and cause a lot of anxiety and stress. This is illustrated by the following example.

Karen is working as an administrative assistant in an academic hospital. She is very dedicated to her work and is always praised for her accuracy and flawless organization of departmental activities. One day, Karen is asked to organize a big medical event for the oncologists in the hospital. *“At first, I felt honored, because it showed the respect that others have for my devotion to my work. However, soon my own desire to organize the perfect meeting became a big burden. It felt as if I was constantly balancing on a “loose cord” to keep my own towering ambitions in line with the (much lower) expectations of others. As the conference came closer, I started to work many extra hours and could hardly sleep because I felt so insecure and anxious. Of course the conference went smoothly and well, and I even received an award for my excellent organization skills, but the stress was hardly bearable and unpleasant”...*

Overdrive

Nearly half of the respondents indicated that they regularly suffer from bore-outs when their need for challenge is not satisfied. However, on the flipside of the coin, many gifted employees easily

go in overdrive because of their driven nature. 95% of the respondents indicated that they usually do more than what is expected from them, and $\frac{3}{4}$ of the respondents even said that they regularly exhibit workaholic behavior. On top of that, they also have the tendency to take over the work of others (48%), to ensure that the quality of the work meets their own high standards. As a result, the risk for burn-outs is substantial: $> \frac{1}{3}$ of the respondents indicated that they alternate periods of overdrive with periods of burn-outs. The following example illustrates how the positive drive of gifted adults may sometimes turn into self-destructive behavior.

Erik leads a team of five laboratory technicians in a renowned chemical company. The team is regularly rewarded by senior management for their outstanding achievements. One day, Erik and his team are asked to implement a new process that could spare the company a lot of money. *"I immediately could envision how the process should work", Erik says "and could not wait to get started"*. However, Erik was so absorbed by his own ideas, that he did not spend enough time to explain the concept to his team mates. As a result, during the following weeks, the laboratory technicians one by one lost their interest in the project. *"I could not understand why my team mates were not as excited about the project as I was", Erik says. "They were just lazy and uninterested, and the work they delivered was really inferior"*. As Erik was still determined not to disappoint his management, he started to take over the work of his team mates and worked day and night to make the project a success. However, soon the project became too ambitious, and Erik started to feel very anxious and stressed. Today, Erik is at home with a burn out, very disillusioned in himself and his team mates.

Discussion

Strengths and needs of gifted employees

Many gifted individuals are well-respected employees, with thriving careers. They stand out because of their perseverance and tireless enthusiasm at work, and are often praised for their expertise and excellent performances. The characteristics of giftedness that were recognized the most by the respondents in this study are in line with the typical manifestations of giftedness described by other researchers in the field (e.g., Corten et al., 2006; Jacobsen, 1999, 2000; Kooijman - van Thiel, 2008; Nauta, & Ronner, 2008, 2013; Shavinina, 2009b). Beside their strong willpower and inner drive, gifted individuals stand out because of their outspoken knowledge and cognitive abilities. They think more rapidly than their colleagues and are able to "digest" large amounts of new information in a relatively short period of time. They are very curious and have an interest in a wide range of topics which they master in great depth. Also, because of their prominent divergent thinking skills, gifted individuals are able to easily integrate information of different sources and discover connections between seemingly unrelated ideas. This in turn 'feeds' the creative potential of the gifted, and the ability to move away from conventional ideas and arrive at unique solutions for a problem.

The desire for knowledge, autonomy, and challenging tasks were the most prominent needs of the respondents in this study. Gifted individuals truly dislike repetitive tasks and would allocate nearly 85% of their time to non-routine tasks if given the opportunity. They have a clear preference for complex assignments and feel very excited when they can participate in challenging projects with other gifted peers. However, when the most challenging phases are over, their interest easily wears off.

Because of their specific strengths and needs, gifted individuals particularly thrive well in innovative and creative environments (Corten et al., 2006; Shavinina, 2009a). These are fast paced working environments with few routine tasks, and plenty of challenge and freedom to stimulate their "sparkling minds". The same positive effects are seen in gifted children who are offered enriched and fast-moving curricula "stripped" from repetitive and already mastered tasks. Organizations with a lot of hierarchy, bureaucracy, and strict procedures are less favorable for gifted individuals (Nauta, Ronner, & Groeneveld, 2009).

Barriers hindering gifted employees

Although gifted individuals have the capabilities to excel in an organization, many of them are not doing as well as one might expect. Longitudinal studies show that giftedness is no guarantee

for success, nor does it automatically translate into satisfying and productive work lives (Freeman, 2010). Many gifted adults struggle in their careers, because they are hindered by unsuitable job contexts, tense interactions with supervisors and colleagues, and/or maladaptive personality traits (Jacobsen, 2000; Overzier, & Nauta, 2013; Streznewski, 1999). Because of these barriers, gifted employees may become “unbalanced” and unproductive on the work floor. They may either go in overdrive, taking too much work on their shoulders, or they may become underperformers, with little interest in their job (Corten et al., 2006).

Unused potential and boredom

The job of many gifted adults offers too little challenge, variety, and freedom to suit their needs and talents. Nearly 80% of the respondents in this study claimed to experience a big mismatch between their intrinsic capabilities and the current requirements of their job. Many feel bored and struggle with the limitations of their job. They may even feel obliged to hide their true nature in order to fit in. Also, the slowness of their environment and the feeling of being held back by others seriously drains their energy. Gifted workers often have the feeling that they could progress much faster if they were allowed to do things on their own.

Some gifted individuals will seek out a way by looking for creative activities or unusual hobbies in their free time. Others at a certain point may feel a strong desire to start looking for another job (~70% in this study). Job hopping is fairly common among gifted employees. Other gifted adults may find a solution in creating their own job context. In a Swedish study, it was found that work satisfaction was the highest for gifted individuals who started their own company and/or were having leading managerial positions (Persson, 2009). In these positions, gifted individuals have more control of their own time and working habits.

However, not all (bored) gifted adults are in the position of creating their own job or changing jobs easily. These employees may simply become ‘detached’ and may (seriously) start to underperform. This means performing (far) below their own intrinsic capabilities but not necessarily below the performance level of the “average employee”. Boredom and mental withdrawing are unpleasant feelings which may ultimately lead to bore-outs (~50% in this study) and long-term absences from work.

Potential pitfalls of gifted employees

Although gifted individuals may flourish in “suitable organizations”, supervisors and human resource managers need to be aware that even if the ideal job context is created, gifted individuals may still become unbalanced if they are hindered by certain emotional and/or behavioral barriers (Corten et al., 2006; Nauta, & Ronner, 2008, 2013; Ronner, & Nauta, 2010; van der Waal et al., 2013). In this study we presented three potential pitfalls typical for gifted workers.

The first pitfall results from the fact that gifted employees because of their high cognitive abilities may experience an “*intellectual disconnect*” with supervisors and colleagues. During team meetings for example gifted employees may feel an overpowering urge to express their thoughts and opinions in the group, but colleagues with lesser cognitive abilities may not be able to follow their (rapid) reasoning and may feel threatened and overwhelmed by the (critical) insights of the gifted. As a result, colleagues may react with harsh feedback or may totally ignore the input of the gifted. In more severe cases, gifted employees may even be singled out from the group. Conflicts like these can be very damaging for the self-confidence of the gifted, especially when the gifted is unaware of the underlying cause and purely acts in the best interest of the company. If not addressed properly, the gifted may start to withdraw from the group and suffer from feelings of worthlessness and depression.

A second potential pitfall is the tendency of many gifted individuals to set *very high standards* for themselves and others. Case studies like those of Richard Branson and Bill Gates show that this tendency may definitely empower gifted individuals to excel and lead to extraordinary accomplishments (Shavinina, 2009c). However, when the expectations become too high and anything

less than perfect is unacceptable, this empowering trait may also become “unhealthy” and lead to maladaptive thoughts and behaviors, such as the refusal to interact with others, the inability to tolerate mistakes of self and others, and the deep-rooted habit of avoiding situations where success is not guaranteed (Kieboom, 2015). Gifted workers may even refuse promotions, because of their fear of not being able to live up to the expectations (Van Zuuren, 2014). In the worst case, unhealthy goal setting and fear of failure may literally “cripple” gifted individuals, making them vulnerable for stress-related complaints and depressive feelings.

On the other hand, gifted workers may also go “*in overdrive*” because of their tendency to set unattainable goals for themselves and others, and may start doing much of the work themselves because of their intolerance towards imperfections. This in turn may lead to workaholic behavior and complete exhaustion in the long run. The current study shows that the risk for burn-outs in gifted adults is substantial as 1/3 of respondents stated that they alternate periods of overdrive with periods of burn-outs.

Helpful tips for supervisors of gifted employees

Gifted individuals prefer to have a lot of autonomy, responsibility and freedom in their job. However, no organization can survive without stringent deadlines and well-defined goals and objectives. Hence, an open and respectful communication with the gifted is essential in order to use their talents in the best interest of the company. Regular interactions with the gifted can help them to stay in line with the company’s expectations and translate their creative ideas into feasible action plans.

It is also important for a supervisor to recognize the potential pitfalls of giftedness at an early stage and provide the necessary guidance where needed. Some gifted individuals are perfectly capable of meeting their own high standards and delivering superb results within the expected time-frames. Other gifted workers, however, may feel overwhelmed by their own high expectations and lack the necessary tools or insights to overcome this barrier. If this is the case, supervisors can help gifted workers to split up projects into small, achievable goals and formulate realistic expectations on the outcome. Supervisors could also assist in managing the time and workload of the gifted and help them to prioritize their activities.

In this respect it is also advisable to not only praise the gifted for an accomplished goal but also pay attention to the way in which projects were handled: were the actions taken in line with the expectations of the company, was the workload evenly divided among the team members, was the project carried out within the normal working hours, etc.? Providing constructive feedback on project management could be a vital learning opportunity for the gifted, because they often do not realize that the norms they set for themselves are far beyond those of colleagues and may even surpass the expectations of the company. This in turn may lead to a lot of unnecessary anxiety and stress.

Conclusion

The constant flow of new ideas is essential in today’s economy. Gifted individuals, because of their intrinsic traits could play a vital role in this. However, in most organizations little attention is paid to the specific strengths and needs of the gifted. Because of this, many gifted employees feel bored and experience a big gap between their intrinsic capabilities and the current requirements of their job. This may result in job hopping and underperformance at work. Gifted workers may also become unbalanced because of typical pitfalls related to their giftedness. If not addressed properly, these barriers may lead to stress-related complaints and burn-outs. Strong support (but not interference!) from supervisors is therefore advisable to help gifted individuals in their pursuit of a happy and successful career.

Although the sample sizes are small, the figures in this study show the significant potential that is wasted in today’s economy because of unsuitable job contexts and lack of proper insight in the functioning of the gifted. The risk of losing some of their most creative workers is high for

organizations that are unaware of the specific needs of the gifted. Further research on a larger scale is planned to further explore this topic.

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Effects of the Dunn and Dunn Learning Styles Model on Reading Comprehension and Motivation: A Case Study in Innovative Learning

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Abstract

The effect of learning preferences on reading comprehension and motivation/attitude has been researched thoroughly in the field of education as a new approach to learning. However, these three elements have not been studied simultaneously using the Dunn & Dunn's preferred learning style theory. Therefore, this study aims at analyzing the elements that motivate a student to learn and the elements that lead to academic achievement. The study is based on the Dunn & Dunn's preferred learning style theory which emphasizes that each student has a specific learning style and that learner's physical, emotional, and sociological needs must be satisfied within the learning environment. Using an ABAB single case study design, an investigation was conducted to determine how learning style preferences affect reading comprehension achievement and student motivation/attitude in a fourth grade student who is struggling with language processing. To measure his attitude towards learning, The Student's Motivation toward Science Learning scale was adapted, and the Dunn & Dunn learning styles were identified through the Elementary Learning Style Assessment. Results showed that the student's reading comprehension and motivational/attitude levels increased significantly when instruction used the student's preferred learning style. The results of these findings can be utilized by educators and parents to help maximize achievement and motivational/attitude levels in reading comprehension.

Keywords: Dunn & Dunn; learning style; reading comprehension; Lebanon.

Introduction

The reason why so many children fail is not because of the curriculum, but the instructional approaches that are dissonant with their learning styles (Dunn, 1990). When the teaching style fails to meet the needs of a particular learning style, then minimal learning will take place (Rhoads, 2005).

Rita and Kenneth Dunn had been advocating school change for decades by teaching instructors how to use different learning styles that maximize teaching instruction (Rhoads, 2005). The Duns define learning style as the way "a person concentrates on, processes, internalizes, and remembers new and difficult academic information or skills" (Ivie, 2009, p. 177). A visual representation has been made in the form of a patchwork quilt that describes the 21 elements in 5 basic strands (Appendix A). The learning-style variables are differentiated from one learner to another and do not affect learners equally. Some learners are affected by

as few as one to six elements, while others may be affected by as many as seventeen (Dunn, R., Honigsfeld, A., & Doolan, L., 2009).

The Dunn and Dunn Learning Style Model has been researched by over 50 American and international educational institutions (Mitchel, 2009). It is based on the theory that each student has his or her strengths as a learner (Mitchel, 2009). The model is represented through five stimuli, which are environmental, emotional, sociological, physiological, and psychological (Mitchel, 2009). Dunn and Dunn believed that each stimulus contains individual elements which contribute in mastering academic skills.

The environmental variable consists of the elements sound, light, temperature, and design. The emotional variable consists of motivation, persistent, responsibility, and structure. The sociological variable includes self,

pair, peers, team, adult, and varied. The physiological variable consists of perceptual, intake, time, and mobility. The last variable, which is the psychological variable, has three components that contain global-analytic processors, hemisphericity, and impulsive-reflective (Mitchel, 2009).

One reason for the popularity of the Dunn and Dunn model is that it was generated by classroom experience and therefore has ecological validity. More than 850 studies conducted in more than 135 institutions of higher education were performed using the Dunn

and Dunn Learning Style Model (Honigsfeld & Dunn, 2009). Many of these studies included the effectiveness of tactual and kinesthetic teaching methods in comparison to traditional methods. For instance, Fine (Honigsfeld & Dunn, 2009), used soft lighting, tactual and kinesthetic instructional resources, and paired students or made them work in small teams when teaching a lesson. The results concluded higher test scores, as well as improved attitude and motivation towards learning. Other studies revealed the positive impact of the Dunn and Dunn model on concentration (Dunn & Dunn, 1979; Brand, Dunn & Freb, 2002).

Meta-analyses conducted on the Dunn and Dunn Model all yielded robust results in favor of the model (Ferdenzi, 1998; Ivie, 2009; Lovelace, 2005).

Methodology

Subject

The participant in this study was a fourth grade student given the pseudonym John, attending an elite private school located in Mount Lebanon, 30 minutes from away from Beirut; it mostly caters to middle to upper middle class students. He was struggling academically in most of his language arts subjects.

Design

This study consisted of an ABAB design in order to determine the student's learning preferences, and their effect on academic achievement, namely reading comprehension, and motivation.

Instruments

STMEL Questionnaire

The STMEL questionnaire developed by Hsiao-Lin Tuana, purports to monitor students' motivation toward learning science (Tuan, Chin & Shieh, 2005). For the purpose of this study, the questionnaire was modified from measuring motivation towards learning science to motivation towards learning English. The questionnaire includes the following scales: self-efficacy, active learning strategies, science learning value, performance goal, achievement goal, and learning environment stimulation (Tuan, Chin & Shieh, 2005). Each item was constructed using a five-point Likert scale, ranging from strongly agree to strongly disagree.

The ELSA

The ELSA: It is an online test that measures the student's learning style. It is available at: www.learningstyles.net

CBM

The use of CBM can determine the students' expectancies of their academic performance (Overton, 2008), and may enhance the academic performance of low-achieving students since it allows instruction to be tailored to their specific learning needs. Baker and Good (in Overton, 2008) asserted that CBM is reliable and valid for assessing bilingual students.

Reading CBM

The CBM passages were different but equivalent in the level of difficulty. The passages were new to the student but were presented at the student's instructional level. Each passage consisted of a

minimum of 300 words. The passages also had 42 words deleted and were replaced by a choice of three words, consistent with the cloze reading probe (Hosp, Hosp & Howell, 2007). A total of 21 different passages were used to monitor the student's progress within the four weeks for a duration of three minutes. The CBM was completed every Monday and Friday of the week at the end of the session to determine if the student was learning adequately, to measure progress, and to ensure that instruction was working effectively.

Attitude Toward Learning Comprehension (ATLC)

The ATLC is an informal scale designed by the researchers to assess motivation/attitude with respect to reading comprehension. The survey consisted of five lines. In each line, the student is asked to choose one of the three adjectives that best describe how he felt about the session:

Line 1: Easy, Indifferent, Difficult.

Line 2: Interesting, Indifferent, Boring.

Line 3: Clear, Indifferent, Confusing.

Line 4: Fun, Indifferent, Serious.

Line 5: Calm, Indifferent, Nervous.

Procedure

The student took a post-test after each control and treatment condition. Quantitative data was collected through the CBM. Qualitative data was sought through the STMEL, Motivational Survey, ATLC survey, and ATLW survey. At the end of the study, both the quantitative and qualitative data were interpreted and analyzed.

Pretest data was collected through:

- The ELSA to determine the preferred learning style of the student;
- Baseline and aimline measures to conduct CBM probes;
- The STMEL test to determine the level of motivation for the student in English; and
- The Motivational Survey to help monitor the student's levels of motivation.

Once the pretest procedures were completed, the program commenced as follows:

The passages used to teach comprehension were extracted from the VV program. (Appendix B)

The learner was exposed to reading comprehension instruction for a period of four weeks, which included five one-hour long sessions per week. Instruction alternated weekly between the traditional teacher directed method (no treatment), and instruction based on his preferred learning style. The two weeks of the traditional teacher directed method (treatment A) consisting of reading passages selected by the instructor, followed by a number of activities, namely providing an oral summary of the text, then answering specific questions both orally and in writing about the text. This traditional method of learning comprehension mimics the one currently used at the subject's school. The teacher directed method (A) was used as the control phase in which the teacher chose how the child would learn. The student was given no choice.

As for Treatment B used during alternate sessions, the student's learning preferences as assessed by the ELSA survey molded the learning environment. The *Visualizing and Verbalizing (VV)* by Nanci Bell was selected because it is designed to help struggling readers develop concept imagery by stimulating the sensory-cognitive functions, thus enabling them to connect and interpret meaning for both oral and written language (Bell, 2007). This program has attractive qualities to the student because it relies on nontraditional and engaging teaching tools, such as large story boards, flash cards, critical thinking questions, and so forth, which tie into learning style accommodations. The methodology used to teach the child followed the same structure prescribed by the VV program: Sentence by Sentence Imaging with Higher Thinking structure, Multiple Sentence Imaging with Higher Order Thinking. The skills for higher thinking included getting the main idea, drawing a conclusion, making an inference, predicting/extending, and evaluating. The student was asked to reach each passage orally and questions were posed by the teacher at the end of each passage.

Teacher Direct Method

Task Cards

Task cards were used to teach reading comprehension. They were made to help John easily remember the material by both reading and listening. They were also used to introduce new material and to reinforce previously learned material. The task cards presented information about a specific reading topic, concept, or skill that was converted into questions and answers. For example, when studying about the different kinds of butterflies in a text, John would make his own Task Cards and print the name of each butterfly on the left side of an index card. He would then glue a picture of the butterfly on the right side of another card. The cards were cut into irregular shaped thirds so that only the card with the correct picture could fit correctly to the card with the name of the butterfly.

Flip Chutes

Flip Chutes were used to teach reading comprehension. They were made from half-gallon orange juice containers. Small question-and-answer cards were inserted into the upper face of the container. As each question card descended into the slide, it flipped over and the answer became visible from the lower opening. John was allowed to decorate the container with paint relating to the reading topic.

Floor Games

Floor games were used for teaching reading comprehension. A game was drawn and designed on an old tablecloth that allowed John to jump and move around as he was exposed to the finer points of the reading topic through questions.

Multiple - sentence imaging with higher order thinking

During this part of the instruction, more units of language were added which consisted of two or three sentences at a time. The lessons continued to include colored felt squares to anchor the imaged parts of the sentences. The structure words are no longer needed, and the questions for detailed imagery are minimized as the student now is expected to imagine with a fair amount of detail. Less questioning was required, therefore each paragraph required not more than 12 minutes, consisting of five various reading paragraphs per session. The difficulty of the paragraphs was gradually increased. The student visualized and verbalized two or three sentences at a time instead of one, placing one colored square for each chunk of imagery. However, the student did not check through the structured words. At the end of each paragraph, the teacher asked higher order thinking questions based on the student's imagery.

The four weeks of the intervention consisted of both treatment A and treatment B. The first and third week consisted of the teacher directed method. The teacher directed method (treatment A) consisted of the pupil learning reading comprehension for 60 minutes per day. During the student directed method (treatment B), the teaching strategies were based on the data retrieved from the ELSA for 60 minutes a day. Task cards, flip chutes, and floor games were additional materials used to convey the information to the student.

Results

For each aspect of the intervention, quantitative and qualitative data is reported.

Results of CBM reading

The datapoints on the CBM Reading graph represent three one minute reading probes conducted on a weekly basis. The graph represents the student's frustration level at a baseline. Progress was shown when intervention was implemented which was on Week Two and Week Four. It showed a positive impact on John within a short intervention period. The solid line represents this rate of progress during those weeks. During Weeks One and Three when there was no intervention, the

desired outcome for academic achievement was not being produced because the CBM observations fell below the aimline.

John's effort, creativity and ability to think critically became noticeable during intervention. He learned how to illustrate his thoughts. Further, intertextual linking and ability to mentally develop a detailed image of the story was reflected during oral discussions. For example, when John was reading information on a certain topic on a task card, not only was he able to comprehend the information independently at hand, but also volunteered to further elaborate on abstract concepts regarding the specific topic. For instance, when reading specific information about a humming bird and how it makes it easier to obtain food, he linked the answer to the question within a matter of seconds and unexpectedly made associations within the text to his previous knowledge. Once he had developed an imaged gestalt of humming birds, he was able to independently infer, conclude and evaluate.

Results of the attitude towards learning English questionnaire

At the first session, John found English to be difficult, boring, confusing. He also felt nervous during the session. This negative attitude towards learning English remained consistent until the fourth session. During the fourth session, a change in John's attitude became remarkably visible. He still found the material difficult; however, it became clearer and more engaging. He became calmer as the sessions prolonged and felt less nervous when learning.

By the end of the 17th, 18th, 19th, and 20th sessions, John felt completely at ease and developed a whole new attitude towards English. The shift in attitude was not gradual. Instead, a sudden positive inclination became visible after the third session.

SMTEL

The SMTEL Questionnaire showed that, after the reading comprehension sessions, John developed a strong liking in reading and considered English as an enjoyable language. These findings suggest that he became more motivated to read. The statistical analysis was performed using SPSS[®], version 20.0.

The dependent t-test that was applied to determine the statistical significance of differences among the rating scales of the first day and the last day of intervention regarding the different sections of the SMTEL questionnaire showed significance on four out of six sections of the questionnaire: Self-efficacy, Active Learning Strategies, Performance Goal, and Learning Environment Stimulation (Appendix C).

Discussion

The researcher examined the student's achievement scores in reading comprehension and his attitude towards learning English when an innovative instructional approach is used, namely accommodating the student's learning preferences using the Dunn and Dunn model. When the student's learning style preference was integrated within the instructional strategies and the learning environment, higher motivation and better reading comprehension were achieved. This conclusion supports the research conducted in more than 120 institutions which showed a positive impact on the learners' achievement (Boyle, 2005; Rautopuro & Vaisanen, 2003). Further, a meta-analysis conducted at thirteen universities in the mid-90s confirmed that students whose learning styles were accommodated could be expected to achieve 75 percent of a standard deviation higher than students who had not had their learning styles accommodated (Dunn, Honnigesfeld, Shea Doolan, Bostrom, Russo, Schiering, Suh, and Tenedero, 2009).

Reading achievement test gains were significant when modality-congruent, learning strategies were implemented. In contrast, when dissonant instructional strategies were employed, little gains in achievement were attained, consistent with findings that learners' academic achievement increases

when the student's perceptual learning styles are blended with instructional learning strategies (Ferdenzi, 1998), especially when instructors are aware of their role as a facilitator in the classroom (Honigsefeld & Dunn, 2009).

During the weeks where the traditional teacher-centered approach was implemented, John was incapable of recalling details from the text or re-telling the text. His summary was in the form of fragments. He was not confident and became irritated when he was incapable of recalling the details of the text he had read minutes ago.

Choice and contrast methods of learning were introduced for stimulating verbalizing and thinking. This instruction only had a small window of time to help John experience success in learning to comprehend and write. Every frame of instruction was aimed at remediating his difficulties since he had been exhibiting failure for years. There was only little time during which he was willing to learn. John validated Dunn et al.'s assertion that

“when students understand how they learn best, they inevitably adjust conditions and devise strategies for facilitating their progress. They become able to study more effectively and realize that it is not what, but how they study that really counts.” (Dunn et al, 2009, p. 138)

Geiser (1998) concurred that this innovative instructional approach improved students' perceptions of their personal abilities and empowered them to strive beyond what they had previously accomplished.

Another variable that showed significant improvement was motivation. As motivation is the key trigger to academic success, highly motivated classrooms consist of teaching strategies that are harmonious with the students' learning styles (Elliot & Dweek, 2005).

Teachers who accommodate students' learning styles deliver content in ways that suitably match students' strengths, hence leading to increased academic performance and improved attitudes toward school (Lovelace 2005). Exposure to learning style requires recognition of the need for diverse strategies designed to complement individual differences. As a result, teachers make a concerted effort to eradicate the one size-fits-all approach and acknowledge the need to modify their classrooms, instructional practices, and assessments (Favre 2007a, 2007b; Fine 2003; Shea Doolan 2004). Education stakeholders recognize that these modifications are essential for academic success. Textbooks and materials are slowly changing from being essentially analytic, auditory, and visual to becoming increasingly global, kinesthetic, and tactual (Fine 2003).

Limitations

The findings should be viewed in light of several limitations. First, the study was limited to one student hence generalization to the larger population is not possible. The attempt to explain the academic achievements of students with LD in education may be more effective if using a larger sample. Future research should use a larger sample and examine students in different school subjects. Second, the length of the study was eight weeks, which is relatively short. Longer observation periods may lead to even more reliable results.

Implications

Findings of this study may influence educational practices and encourage teachers to implement innovative approaches of teaching through accommodating students' learning styles.

To teach effectively, teachers must know how to teach pupils based on the latter's identified brain processing, environmental requirements, sociological inclinations, perceptual strengths, and interests or talents.

In fact, one of the tenets established by The American Association of Colleges for Teacher Education in 2008 to prepare preservice and in-service teachers to teach students who come from

diverse cultural and linguistic backgrounds is the recognition of learning-style theory and research (Dunn et al, 2009). As early as 1980, Scott Thomson, executive director of NASSP, stated that “the ability to map learning styles is the most promising development in curriculum and instruction in a generation. It is the most scientific way we know to individualize instruction” (Dunn et al, 2009, p. 139).

Recommendations for future studies include a longer intervention period of at least 2 to 3 months, and implementation on larger samples that include different age groups, abilities and socio-economic backgrounds to examine the effectiveness of the Dunn and Dunn Learning Styles on various cohorts across time.

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Note: If you are interested in getting a copy of the appendices, contact the authors.

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What Do You Think?

Seeking Out the Voices of Responsible Iconoclasts in our Schools

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"I respect faith, but doubt is what gets you an education."

Wilson Mizner

Abstract

The purpose of this study was to invite Manitoba high school classroom teachers into a think tank and ask them what they believe they do to help adolescents stay in school and graduate. The study found that teachers took great care in examining the current educational system and practices; they continuously searched for and suggested innovative ways to improve their classrooms, schools, and the system-at-large. Based on the information gleaned from the teachers in this study, it was clear that school systems would benefit greatly from seeking out the voices and drawing upon the talents of high school teachers, and asking them what they think.

Given the personal nature of think tanks, I have chosen to take an informal, first-person approach in writing this article. And to lay the groundwork, I'll begin by stating that I want to see education in Manitoba succeed. I believe that Manitoba Education and Training (our Ministry) should be applauded for taking on the challenge of producing policies and documents in order to make success possible. Great strides have been taken in terms of recognizing and promoting equitable education for all students. Similarly, this province's universities and school divisions have worked hard to ensure that tomorrow's education system will be even better than what we offer today.

School leaders have enthusiastically accepted the challenge and committed time and resources to ensure that their teachers are trained and equipped with the most innovative and promising strategies in order to provide our students with one of the best education systems in the world. These efforts should be commended, especially when one considers that, by the time students enter high school, the range of academic, cognitive, behavioural, and socioeconomic diversity of Manitoba students can appear immense and overwhelming. It is little wonder that even the best provincial and divisional academic policies, strategies, and professional development initiatives cannot possibly be expected to solve the exhaustive

number of problems that arise in our schools every day.

Still, I see many brilliant, hardworking, dedicated, and talented classroom teachers who somehow creatively and collectively find solutions for monumental challenges. As my current role as a school administrator allows me to observe how others teach and gives me the opportunity to talk with many educators about teaching and learning, my admiration and respect for classroom teachers has only grown. When we simply employ models that expect classroom teachers to receive information (requiring them to attend professional development seminars or pressuring resource consultation upon them), it risks making them feel defensive and filled with shortcomings. Instead, I believe that teachers should be sought out because of their talents and asked to share their acumen. They are the only ones who have intense, daily contact with many students at once; they are the ones who have a unique and intimate understanding of the school system; they are the ones who convert inclusive policy, philosophy, and pedagogy into practice; and they are the ones who are obliged to listen to policy makers, school administrators, parents, resource teachers, university professors, learning experts, and the students they teach. I think that it is crucial that their voices be heard.

The study

The intent of this study was to seek out Manitoba high school classroom teachers, invite them to participate in a think tank, and capture their voices concerning what makes them successful at helping young people remain in and complete school (Reimer, 2014). I attempted to capture and honour the voices of high school classroom teachers using qualitative methods. Obviously, an initial step was to establish an interactive discussion group of high school teachers. Before I assembled the teachers together, however, I needed to find a construct that provided me with the best opportunity to accurately obtain authentic responses from them.

I hoped to reduce the risk of “moderator acceptance bias” (Hoets, 2013), where respondents provide answers that they believe will primarily please the moderator. I also hoped to reduce the risk of what I characterize as “sociopolitical acceptance bias,” where participants feel overly pressured to sacrifice their true thoughts for political correctness. My rationale was that if the culture for open, honest responses could be fostered within the group, then teachers might feel more emancipated to confidently and thoughtfully share their perspectives.

Moderator acceptance bias

I had concerns that those who were willing to take part in my study might taint their responses in order to provide me with the answers they thought I was seeking. For example, I was concerned that if teachers learned I was studying in inclusive education, they might not share whatever concerns they had regarding inclusion, preferring instead to speak glowingly about a phenomenon that, in reality, they struggled with on a regular basis. To reduce this risk, a shift in power needed to take place so that the participants viewed themselves as authoritative experts on the subjects we discussed, while my role was to learn from them. Therefore, instead of surrounding myself with sycophants, I sought to find what Caliva and Scheier (1992) referred to as “responsible iconoclasts.” As they explained:

‘Let no assumption go unchallenged’ might be our motto, provided we’re not wrecking conventional certainties for the sheer perverse joy of it. We should understand that analysis often produces even greater faith in previous assumptions, because now we understand why.

Sociopolitical acceptance bias

While reducing the risk that moderator acceptance bias might affect the results of my study, I also tried to reduce the risk of the effects of “sociopolitical acceptance bias.” For example, inclusion and inclusive education movements appear to hold incredibly powerful social and academic potential in combating the ill effects that segregation and inequality have had on our most vulnerable and marginalized peoples. However, the swell of public attention devoted to this issue has also made it very political, which could prompt the participants to deliver what they regard as “politically correct” responses, rather than honest ones.

Berry (2011) argued that objective investigations of inclusive education are not as prevalent as those of special education, primarily because inclusion has become such a “powerful rallying cry” (Dyson 1999, p.49). Levins (1985) noted that many researchers use the phrase, “It’s a scientific fact” (p. 4) to support their claims, and that, “Nothing evokes as much hostility among intellectuals as the suggestion that social forces influence or even dictate either the scientific method or the facts and theories of science” (p. 4).

Willis (2007) cautioned readers on the dangers that political pressures, no matter how well intentioned, can have in biasing empirical research. The “Lysenko Effect” (Roll-Hansen, 2004) illustrated the crippling and distorting consequences that political pressures can potentially have on scientific objectivity. In the 1920s, an uneducated but influential Russian politician named Trofim Lysenko dismissed the Darwinian theory of evolution and promoted French scientist Jean-Baptiste Lamarck’s theory (Roll-Hansen, 2004). Some scientists who rejected Lysenko’s popular viewpoint

were “sent to gulags or to undocumented deaths after the secret police arrested them in the middle of the night” (Willis, 2007, p. 29). Roll-Hansen (2004) described the Lysenko Effect as “the biggest scandal in twentieth century science” (p. 12) and posited that although it ultimately led to disastrous outcomes, it was initially born out of an attempt to “transform science into a better instrument for social progress and justice” (p. 13). Certainly, it offers a valuable case study on how the ideals of a social movement, if not properly taken into account, can potentially distort the results of objective science anywhere.

I wanted to reduce the risk of transferring any political or social pressure from me, as a researcher studying the field of inclusive special education, to those who agreed to participate in my focus group. Therefore, I needed to use an approach that shifted the power from me as a researcher (and school administrator) to the high school teachers as participants. In a focus group setting, I hoped the teachers would feel free to earnestly and confidently share their true thoughts.

The think tank

While I could have interviewed high school classroom teachers individually, there appeared to be numerous benefits in gathering them together into a group think tank. Indeed, Aristotle made this point back in the fourth century B.C.:

For each individual among the many has a share of virtue and prudence, and when they meet together, just as they become in a manner one man, who has many feet, and hands, and senses, that is a figure of their mind and disposition. Hence the many are better judges than a single man (Jewitt, 1885, p. 86).

Aristotle’s views concerning the astuteness of collective voices have been echoed by more recent authors. Surowiecki (2004) described the merits of collective insights as “the wisdom of crowds” (p. 3), Patterson, Grenny, McMillan, and Switzler (2002) acknowledged the advantages of allowing all stakeholders an opportunity to join in conversations and add to the collective “pool of shared meaning” (p. 21), and Miller (2010) noted that the wisdom of crowds was most effectively extracted when the moderator followed three key steps:

- (1) Seek a diversity of knowledge;
- (2) Encourage a friendly competition of ideas; and
- (3) Use an effective mechanism to narrow your choices. (p. 43)

My hope was that by assembling a group of high school classroom teachers from different subject areas, schools, and divisions, I would successfully be able to seek out a diversity of knowledge. In order to better encourage friendly competition among the teachers in question, I employed a “think tank” model (Weaver, 1989) – an approach I thought would be effective in reducing some of the aforementioned biases and obtaining the best insights. By creating a mechanism for both cooperation and competition, I hoped to get what Charles (2000) referred to as a *coopetition*.

Caliva and Scheier (1992) believed that think tanks support free, honest questioning and analysis, noting, “Responsible iconoclasm is the main characteristic distinguishing think tanks from ordinary problem-solving” (para. 57). Think tanks should not be confused with professional learning communities (PLCs), although both groups could bring teachers together to solve educational problems. PLCs assemble professionals for the purpose of “learning together” (Dufour & Dufour, 2012), while think tanks encourage them to “think together.” Therefore, a think tank could be described as a *Professional Thinking Community*.

Think tanks have recently enjoyed popularity and academic interest as a research subject, particularly in the English-speaking world (Pautz, 2011). One of the reasons for this rise in popularity is because think tanks allow scholarly autonomy. Pautz argued that such autonomy was a critical component to the credibility of the think tank.

Using a think tank model, I attempted to encapsulate some of the concepts, methods, and practices that teachers successfully incorporate into their classrooms to help students stay in school

until graduation. I hoped that the classroom teachers participating in the study might view themselves as sources of ideas and expertise, evaluators of policies and programs, and authoritative sources of information and opinion, since these are critical components of a think tank (Weaver, 1989). I also wanted them to feel autonomous when they participated – a necessary ingredient for a think tank to be effective (Pautz, 2011).

Structuralist, pathological, and interventionist perspectives

Again, the goal was to gather together an autonomous group of talented high school classroom teachers and allow them to share their insights freely (which might generate new ideas for increasing graduation rates in Manitoba). Although the autonomy of educators within the focus group may seem great and diverse, Skrtic (1995) believed that when discussing topics like diversity, disability, and democracy, people tended to identify with the structuralist perspective, the pathological perspective, or the interventionist perspective. Freeze (2013) applied these archetypes to how educators view their world and challenges faced by school systems.

More specifically, Freeze (2013) described structuralists as people who take “a pro-active approach to institutional and pedagogical reform grounded in a critical sociology of systems dysfunction due to wrong-headed beliefs, policies, provisions, and practices” (p. 9). In contrast, he noted that those who adopt the pathological perspective feel that school failure is the result of deficits within the student: educators who take this view “believe in a re-active, institution-strengthening approach” (p. 10). Freeze went on to observe that those with an interventionist viewpoint believe that “whatever the problem or opportunity, a properly researched, designed, and implemented intervention will make things better” (p. 8).

If I were able to get representation of each of these perspectives within my study, it would increase the likelihood of obtaining exciting and innovative insights regarding increasing high school graduation rates. On the other hand, I wanted to be careful not to overestimate my expectations from the group. Caliva and Scheier (1992) cautioned,

Unrealistic exceptions can poison any process, especially think tanks. From prior think tank participants, the following are some reasonable, expected outcomes: General mental challenge, consciousness raising, shift in focus/new approaches/fresh perspectives, creative ideas, new and better questions and problem statements, support and understanding of colleagues, catharsis/ventilation, renewal and rededication.

Freeze (2013) also noted, “It is almost always better to do an exceptional job solving a small number of problems or initiating a small number of new initiatives, than to run from crisis to crisis resolving none” (p. 15). For this study, the intent was to create a climate wherein teachers could share some new initiatives, for one never knows the large effects that “tiny” ideas and insights can generate when developed by those working within the system itself.

Procedure

After receiving approval from the Superintendent, I began the recruiting process by contacting the principals of several high schools in the division. All teachers from each school’s staff were invited by the principal to participate in the study. Participation was optional. Once I received written consent from interested teachers, they were invited to assemble together to form a “think tank.” In order to encourage participants to speak freely without fear of future reprisals, all teachers were asked to sign a confidentiality agreement.

The think tank model that I selected to follow for my study was Caliva and Scheier’s (1992) *Center for Creative Community* approach, essentially because it provides logical, sequential steps to organizing think tanks and seems especially sensitive to working with volunteer participants. While I

was looking for talented high school teachers based on qualities such as number of years in the classroom, education, professional development presentations, or awards won, “qualifications for think tank participation are based more in the character and style of the person and are far better judged from the inside (by the individual) than from the outside” (Caliva & Scheier, 1992, para. 26).

Participants

Although, as it turned out, all of the participants (n = 9) were currently teaching in one of two high schools in the same division, their backgrounds varied in many ways. As Figure 1 indicates, six were male and three were female. Two were between 20 to 29 years old, three between 30 to 39 years old, two between 40 to 49, and two over 50.

Table 1 : Teacher participant information.

Gender	Age (years)	Teaching Experience (years)	Subjects/Areas Taught	Post-Secondary Education (Degrees)	Awards/ Recognition	Provided Professional Development in school/ division
M (6)	20 to 29 (2)	Less than 5 (2)	Industrial Arts Physical Education	Bachelor of Education (9)	3	3
F (3)	30 to 39 (3)	5 to 10 (2)	Pre-Calculus Essential Math English Social Studies Geography	Bachelor of Arts (5) Bachelor of Science (3)		
	40 to 49 (2)	11 to 20 (2)	History Chemistry Biology	Industrial Arts Diploma (2)		
	Over 50 (2)	20 to 25 (2)	Resource Guidance Credit Recovery EAL	Masters in Arts (2) Masters in Education (2)		
		Over 40 (1)	Leadership Philosophy Aboriginal Studies Law	(2) Ph.D. in Education (2)		

The range in teaching experience in Manitoba varied dramatically. Three participants had taught in the province for less than five years, two between five and 10 years, two between 11 and 20 years, one between 20 and 25 years, and one for over 40 years. It should be noted that two of the nine participants had led professional development workshops for school or divisional staff. Additionally, three participants had received recognition or awards for teaching at some point during their careers.

Collectively, the teachers had taught a wide variety of subjects and at all high school grade levels. Two had taught or were currently teaching in Industrial Arts programs, and one taught Physical Education part time. Of course, participants also taught academic subjects, including Mathematics (Pre-Calculus and/or Essential), English, Social Studies, Geography, History, Chemistry, and Biology. Two teachers indicated that they assisted in the Resource department, one was assigned to Guidance, two taught in Credit Recovery programs, and one provided English as an Additional Language (EAL) support. Other courses taught by participants included Leadership, Philosophy, Aboriginal Studies, and Law.

Teacher participants’ post-secondary education also varied. All had obtained their Bachelor of Education degree. Five of the participants also held a Bachelor of Arts, and three had earned a Bachelor of Science. Two had diplomas in Industrial Arts. Two others had obtained a Master of Arts, and two more a Master of Education. And two participants in the study had earned their PhDs in Education.

Data collection

The think tank was held over a three day period. I invited the teachers to a get-together on a weekday evening, and ended up extending this first meeting time to four hours. This way, I was able to reduce the number of remaining meeting dates to two, instead of three. Based on the email responses I received from the participants, this was the unanimously preferred option. For this think tank, the opening question was, “What is it that you do in your classroom that you think reduces the risk of students dropping out, and increases the probability that students will graduate?” All agreed that this was a suitable question. Several important themes emerged from the study, but –for this paper – I’ve chosen to emphasize the component where “The participants took time to examine current educational practices and continuously searched for innovative ways to improve (a) their classrooms; (b) their schools; and (c) the system-at-large.”

Discussions were, of course, transcribed. As the think tank sessions became more animated, good grammar sometimes went by the wayside during the hot-and-heavy conversations. Afterward, for the sake of clarity, minor edits were occasionally made to the transcribed material.

Thinking together and out loud

The teachers in the think tank seemed to enjoy the opportunity to think “outside of the box.” After some initial apprehension, they soon felt comfortable enough to freely share their thoughts aloud. For the most part, the participants did not seem overly concerned if their ideas were met with some skepticism or even disagreement at first. Rather, they appeared to enjoy the discussion and, to some extent, the debate with one another. One teacher stated that the think tank, “allow[ed] me the chance to express an opinion. It's very rare that we get heard in such a way.” Another provided the following perspective:

My fear is that [in a group like this] we agree because of our mutual understanding and respect for each other; but at the same time I think it has managed to give us the chance to like speak from a different perspective which we wouldn't have done. I appreciate the chance.

At this point another participant offered to the group, “You know, if I didn't agree with you, I'd tell you.” Since it offered an opportunity to discuss their current successful practices with other educators, it was not surprising that the teachers shared a favourable perspective of participating in the think tank. Certainly, the participants provided many examples of how they took the time, while teaching, to examine current educational practices, enabling them to search continuously for innovative ways to improve schools at all levels.

Improving classroom practice

Overall, during the think tank experience, the educators offered the following suggestions for improving classroom climate, tone, and practice:

Create authentic opportunities for students. Participants shared many ideas on how they could improve their own classroom practices. They discussed effective strategies to connect with students and make subject curriculum accessible to all; they noted ways to turn inclusive education policy into classroom practice; they shared ways to find funds for field trips and clubs, meals for students, and events for parents; and they highlighted formal and informal ways to collaborate with colleagues. As well, the teachers provided several other indicators for identifying student needs and adjusting their practices accordingly. One teacher offered this comment:

I had students in the class that probably would never be able to comprehend some of what was asked for in the curriculum, a bunch of people in the middle, and a whole variety of personalities. I began within a month of my first year of teaching to devise an individualized kind of math program, so that the kids who were keen and got it could move forward.

The teachers also shared that being personally viewed as authentic was not enough for some students, and discussed the need for authenticity to be incorporated into the daily classroom work. One teacher stated,

So, trying to have authentic ways of having what the kids were doing in school become purposeful and meaningful to them was a primary goal. So, I was exploring. I could say a lot more about that, but it gives you a picture.

Employ eclectic styles of teaching to increase student engagement. The participants did not tend to latch on to one particular teaching method but seemed more focused on finding the most natural approach for themselves and the most effective strategy for their students. As one person commented, “I completely support all teaching styles, other than abusing styles. I always say, work to find who you are and create who you are.” One teacher was skeptical of those who propose “one size fits all” educational approaches, saying, “I do not like when I hear people telling me that it works for everybody, because it doesn’t. I do not like that word that this will be fantastic for ‘everybody.’” Other teachers noted the importance of continuously assessing their own knowledge of the subjects they were teaching, with the purpose of mastering the material. As one explained, high school teachers need to work hard to become experts at their curriculum if they hope to differentiate the instructional methods used in their classes:

Because I was learning it as those kids were learning it, I wasn’t as knowledgeable as I would have liked to have been. I’m sure the kids got what they needed (the first time I taught the course), but it was very book oriented at first and then, you know, as I moved through the year, I started to get more comfortable. I started adding more projects, here and there, and now there is lots of diversity.

The teachers thought that being confident in the subject matter made them better prepared to explore different teaching methods and strategies. One shared that the combination of increasing his subject knowledge base, combined with an expanding awareness of the construct of multiple intelligences, seemed to collectively improve student achievement: “I mean, we have a lot of keen but diverse bunch of kids and we are trying to reach them in any way possible, right? The humanities are really good for multiple intelligences.” Another teacher stated he was recently attempting to incorporate, “more physical engagement; getting them to do more stuff, whether that is field trips, experiments, or hands-on activities.” One participant notes that his recent shift towards more project-based learning yielded some promising results:

I have a few tests but the main projects are the main tests. I guess you can say that our assessments are projects, individual projects – standing up in class and presenting, and doing a written assignment as well. I find that kids learn more and they work harder than if I actually gave them the test. They hate tests, but they love these projects. It gives them the ability to be creative, for every project is different in a way that is very unique to each student. Yet, they are learning more and they don’t even feel like they are learning.

Learn to navigate the risks and rewards of technology and innovation. The participants also shared that they were constantly pursuing and testing ways in which technology could assist in reaching students. One teacher pointed to the potential of combining online instructional opportunities for students who were, for a variety of reasons, unable to attend class on a regular basis:

I remembered when I did some of our university courses, you just went on online. For one student that I teach, it’s so terribly difficult for her to take two buses to her class, right? That would be a great solution for her. I think we have a better chance of her turning on the computer and just being present in that way, right from home. So there is an idea right there.

Another teacher offered that the recent explosion in multimedia and technological advances meant that students were accustomed to receiving a bombardment of information all at once. This participant wondered aloud how these advances could be effectively utilized in the classroom: I showed a YouTube clip that had to do with a news report from CNN or FOX or whatever, and in the

clip, the news report and all this stuff was happening. There was stuff going across the bottom. There was stuff pounding you with this information and fast information, and the kids picked up on this stuff at the bottom of the screen incredibly well. We were trying to do what we were doing and we were watching the CNN guy or whatever, and they were commenting on the things that were going across at the bottom of the screen. I thought that was really a telling sort of moment, not only for their ability to focus on something, but also to multitask. That information is flying by. Fast, quick snippets of information – they have been sort of really guided towards that.

One participant discussed how a recent shift in his own philosophy permitted him to release some of the direct teacher control in the classroom, and “put the learning in the kids’ hands.” Although he was initially reluctant, eventually this individual got great satisfaction in pursuing this tactic. He shared the following incident:

There are lots of avenues I’m sure people have taken, but I found if you put the learning in the kids’ hands, I have been very surprised and pleased at how well they have done. I need to give them more credit and not be so in control of my own stuff here. In university recently, they really stressed getting away from the direct teaching method and having students inquire more into their own learning. And so that is what I tried to do, and it actually does make a difference. It feels scary when you let go of the control.

The teacher further offered that his discovery was exciting to him, and that he felt compelled and obligated to share it with colleagues in his department. He was not surprised to be met with some resistance initially:

I think a lot of seasoned teachers have their way of doing it; they have established their stuff, and it’s very much a control thing – I know what I am doing, this is what I do next, I have my assignments all in order, and if I experiment and lean away from that, What’s going to happen? It’s very scary. Are they going to get it? Are they not going to get it? What if they do, and what if they don’t?

The participant then noted that when faced with such resistance, he decided that the best approach was not to present an overly naïve or idealistic front. Rather, he decided that the most effective approach was to show the department evidence supporting this method of teaching:

I think a lot of people look at me with why am I wide-eyed and bushy tailed, an idealist, and they kind of roll their eyes or scoff at what I am saying. And I say, ‘You know what, it speaks for itself, I think. I had a grade 12 [course] and my class had the best result in the provincial exam.’ There are lots of variables; some teachers had a higher concentration of weaker students and some more stronger ones. There is definitely value to it.

Everyone in the think tank provided examples of taking time to reflect on their current classroom practices, and shared numerous stories of how they were always seeking to better their craft. Some of the ideas, like teaching to multiple intelligences and adapting their instruction, seemed to be ones that many other teachers were already incorporating into their practice.

Others, such as using computers and Internet technology to reach non-attending students at home, were less widely adopted. And still other ideas, including using multimedia to provide a wealth of curricular information at once, were still in an embryonic stage. Finally, a few ideas (e.g., putting more of the learning in the hands of the students) were initially met with resistance and skepticism by colleagues. Regardless of the idea, it seemed that all teachers in the think tank took time to identify and think about new and better approaches in the classroom, and test them out.

Improving schools

Participants in the think tank also shared several examples that indicated their respect for the role and authority of school administrators, and that they appreciated being sought out by them for their opinions on issues pertaining to the school. Two examples were highlighted by two teachers who expressed their gratitude at being meaningfully involved in reviews of their schools' attendance policy and out-of-school suspension policy. These reviews ultimately resulted in amended policies that the teachers felt invested in, especially as a means of better serving students who were at risk. Even with new school approaches in place, it should be noted that the participants were still thinking about better, "next step" models.

The aforementioned examples were just two of many where the participants demonstrated taking the time to think about their schools, and how those schools might be adjusted to better meet the needs of their students. One teacher light-heartedly stated, "If I had my choice of doing anything, I'd like to have my own school." While this comment caused others in the session to chuckle, it also supported the notion that high school teachers did take time to imagine ways to improve the schools where they taught.

Explore the possibility of shortening classes and courses. One teacher shared her thoughts about a recent study she read that focused on shortening the length of time it takes to complete courses, and wondered if more compressed options might be better for students repeating subjects in her school:

So the question is not about she cannot do it, but that she can. But there are other factors that affect her attendance, like maybe boredom because she's older and already knows the stuff, and why does she have to keep on learning that. And we also have non-semestered courses like English and Math that are taken for a full year long. I just heard from a colleague that there was a study done with Aboriginal kids which showed that enthusiasm to learn will be there for a certain period of time, but naturally after awhile it would die down. I was told that if a kid would see the end then right away, then that kid might exert more effort to get the credit. But if it was necessary to wait till June to earn that credit, then that kid might just give up. That knowledge should inform policy makers.

Related to the amount of time spent in class, one teacher questioned whether the class length that the school chose was the most effective for every student's learning, given the variety of attention spans encountered by educators:

Sitting in a classroom for one hour and twenty minutes is very long already. I think that's the difference too, right. The attention span of the kids from elementary is very short. You are hoping that the middle years kids have more attention span, and still more in high school. Yet you think perhaps that's too long a time to spend sitting. Even as an adult, if I am sitting for a long time I feel like I am so tired, and I need to get up and move a little bit. I think that is a factor to consider.

Examine the potential of experiential learning opportunities. Another participant enthusiastically shared a new appreciation for incorporating place-based learning opportunities into the classroom. This teacher believed that to be successful, place-based learning required school-wide support because it crossed over into different subject and department areas. The individual offered the following description of this approach:

I think we need more place-based philosophies in education (in our school). I am a firm believer in place-based education. So, you begin by literally focusing on individuals within the context of their immediate surroundings, and by doing that and by taking curriculum points, educational opportunities emerge from that first and immediate sense of place. You make it a lot more engaging and a lot more relevant to the student.

One participant thought that the school needed to re-evaluate the overemphasis on post-secondary options, believing that it could send the wrong message to students already overwhelmed by the system. The teacher stated,

I think a lot of the problems with school are that we gear towards higher education. I love the fact that we give them that option, but I don't think every kid can aspire to that or wants to, and we don't give them the options of something else.

Another participant shared her involvement in a joint venture with school administrators to investigate different out-of-division programs as a means of exploring alternative methods of instruction:

I know that [outside school division] has a program that is kind of similar [to ours], so I was just talking to administrators who were going to go visit that program to see how it works. I guess it is not so much a drop-in centre, but math and science and English and history are all in one room. So they are working on different things, and there are a couple of teachers in the room, and it's kind of modular . . . and we are going to look at that, to see if they are a little more successful in their program. Because, I know with the program that I am doing right now, while it works for some, it doesn't work for all of them.

Improving the system-at-large

Some of the participants shared examples of their thoughts on larger divisional policies and provincial legislation aimed at increasing graduation rates (e.g., raising the compulsory age of schooling from 16 to 18, promoting inclusive education, encouraging better student attendance, and seeking out alternatives to out-of-school suspensions). Many pointed out that they were satisfied working within the system they were in but still thought it worthwhile to explore ways to improve upon it. One teacher noted, "I am extremely happy in [my school] division. I mean there are lots of things that go on that are not necessarily to my liking but all in all, it's a great division and great support."

Be mindful of the curriculum, but also remember that overly rigid adherence to it can restrict valuable opportunities for students. The positives notwithstanding, some participants in this think tank boldly shared examples of ways they might effect change on a larger scale. One questioned whether or not the system emphasized reliance on course curriculums too rigidly, stating that, "It's a guide." Another enthusiastically offered the following somewhat audacious attempt to improve the system by proposing a collaborative model of teacher training at the university level.

I just called, cold call, the dean at the Faculty of Education: 'Hello, my name is . . . and this is what we are doing.' I called and set up a meeting with [people at the University of Manitoba, Faculty of Education]. We had between 10 and 12 high schools involved, where we had cohorts of student teachers. We had developed a student teacher portfolio model, and we had school-based courses and courses of just a half credit. I would find 'master teachers' or people in the community and we would do these courses. I was highly involved and a lot of really exciting things came from that. Most of the money went to paying for substitutes for teachers to work on developing their own innovations within their teaching practice and to go to some conferences and do some school visitations.

Understand that while graduation rates are important, preparing all of our students for the world after high school is also essential. One of the more interesting exchanges of opinions occurred when a teacher in one of the think tank break-out sessions shared an opinion that seemed to question my study's focus on increasing graduation rates, and asked if the priority of preparing students for the "real world" would be a more significant objective. Similarly, another participant expressed the following viewpoint:

Statistically 20% of all kids that graduate high school are the ones that end up going to university, that's in the first year. What happens to the other 80%, what are we doing for those people? We're sending them out to the job force; they're becoming labourers; they're going into the service industry. How did we prepare them for this? We didn't, and again, for the 20% that go on to university, how many stick it out after the first year? How many more drop out and then go get some other type of job. So, the big question is, What's the purpose of school? To have kids get a piece of paper when they are 17 or 18 years old going, 'Look I got this; big deal. How does that help me?'

In another think tank session, a teacher also wondered about my 'big' question, expressing frustration at graduating students who did not seem to realize that regular attendance and personal accountability were critical qualities that employers valued, and asking how this message could better be related to our students. At another participant's request, he elaborated upon his reservations:

I don't know of any job where you could have twelve absences without really reporting to your boss why. I think that there is a disconnect there, and I think it is a real problem that we need to address. My brother-in-law once asked me a question, because he had younger students coming out of grade 12 and going to work for him in construction who had no problem showing up late to work. He would say, 'The first twenty minutes are important because that is where I give out the job and tell them what I need them to do; and when I talk to them about payment, they have an issue with that too. Not that you don't understand – sometimes you miss a class or sometimes you can't make a class, but 20 absences, that's pretty high, right?'

Following these expressions of frustration came a brainstorm of ideas attempting to resolve the issues. That is, the think tank participants began to focus their discussion towards possible alternatives to the traditional high school model, and how it could better promote personal accountability. One teacher offered this suggestion:

I think what should be done is keep it [mandatory school attendance age] at 16, and maybe have an option of kids going to a trade school for a couple of years after that to prepare them for, you know ... A lot of these kids, they've figured it out: this is not my specialty, I need to do this, I need to, you know, I want to go to work. I want to do that. So instead of sending them to the workforce at 16, let them learn a trade – that, to me, just makes sense.

Another participant offered that the system needed to provide more exposure to the world after high school, and expand upon already existing programs:

I'm just thinking about the program called, 'taking your kid to work today' – where, in one day, the kids get to observe and experience the workplace. So, I'm just thinking it could be something similar to that, where they feel the real world is here and they really need to do something in order to fit into that world.

One participant shared that he was attempting to do this informally in his classes already, and briefly described his programming method:

Afternoons is going out to whatever they're interested in. So, if they are interested in pharmacy, they might be able to go to a drug store or pharmaceutical company; or if it's engineering, to an engineering firm. So a lot of their time is spent outside of the class in workplaces.

The think tank model I used for this study seemed to provide a safe forum for teachers to share their thoughts and ideas on a wide variety of topics. In each of the sessions, the high school teachers openly discussed many of the frustrations and challenges they faced. They addressed sociological and socioeconomic issues; they talked about problems around the mental and emotional health of their students; they shared examples of inadequate funding and insufficient space; they identified problems in trying to meet the needs of a wide diversity of learners and skill sets within the

same classroom; they raised concerns about the size of classrooms, the length of courses, and the length of classes; they spoke about a variety of disconnects with students, their parents, their social workers, and even the difficulties they encountered trying to connect with colleagues on a regular basis; they considered the struggles they had putting provincial legislation and policies into classroom practice; and they noted that standardized testing, provincial examinations, and preparing students for life outside of public education were all daunting and formidable challenges. One teacher made the following observation at the conclusion of a think tank session:

We dump money into a lot of things and it never works, right? I think doing what we just did here – giving meaning to learning and understanding and being able to talk and to come together as people, even with our differences – and still finding commonality and learning from that. [Being able to say] ‘I really like what you said,’ [or] ‘I did not think of the situation that way until you said it.’ You know, so it’s good to have outside perspective. There is much mutual or prior knowledge that we can draw upon.

Challenges, acknowledgement, and problem solving: An emerging pattern

Importantly, after each challenge was presented in the think tank session, something very interesting happened. As shown in Figure 1, teachers with similar experiences readily affirmed that they too struggled with many of these issues, and acknowledged that many of the problems were complex. Next, they began to share different perspectives, offer suggestions, propose ideas, and collectively devise strategies in order to resolve these dilemmas.

Clearly, there were many benefits in using the think tank model. Participants seemed eager to share innovative ways to teach students in their classrooms and seemed proud of being creative. They described scenarios in which they were original, adventurous, and independent when approaching issues within the classroom or school. Throughout each of the think tank discussions, it seemed as though all the participants reflected upon moments in their educational lives where the importance of having a certain self-reliant spirit as a teacher surfaced. Some seemed more self-sufficient than others, but all provided examples of independently resolving issues with and for students. This self-reliant, almost pioneer-like spirit was most epitomized in the following statement by one teacher:

I thought that the boundaries of the education system were going to be my enemy. But as it turned out, my greatest challenges were my own limitations; it wasn’t the public school system, it was my own capacity to imagine and manage and create appropriate environments for these kids. So it was a huge, huge learning experience, as I went from blaming to taking on personal ownership for my life as a teacher.

As indicated previously, these teachers provided many illustrations of how they took time – on an ongoing basis – to examine current educational practices, question in “responsible iconoclast” fashion, and search for innovative ways to improve schools at all levels. They also shared their need to pursue and assess ways in which they could engage students more effectively. And when they found a promising new approach, the teachers wanted to share it with their colleagues and offer evidence supporting their discovery’s potential.

Are high school teachers “Heuristic Interventionists?”

Previously, I drew attention to the different archetypes of teachers (Skrtec, 1995), the perspectives each of them tended to bring to the profession, and the way in which Freeze (2013) applied these archetypes to how educators viewed challenges faced by school systems. In this study, I found that – depending on the issue being discussed – each participant did in fact seem to lean toward one of these archetypes or another. Still, while teachers did focus on systemic or structural challenges, or pathological challenges, most seemed to take on the “interventionist” role in the think tank sessions, sharing many thoughts about their own preventive practices.

One interesting observation that I noted from the think tank was that teachers spoke with great pride when they created one-of-a-kind interventions for unique situations. For example, one

individual became very animated as he described how a moccasin-making club engaged an at-risk student. Another teacher spoke excitedly of how a hip hop writing club engaged students in their English writing class. And yet another participant shared how baking bread everyday helped bring at-risk students into school early.

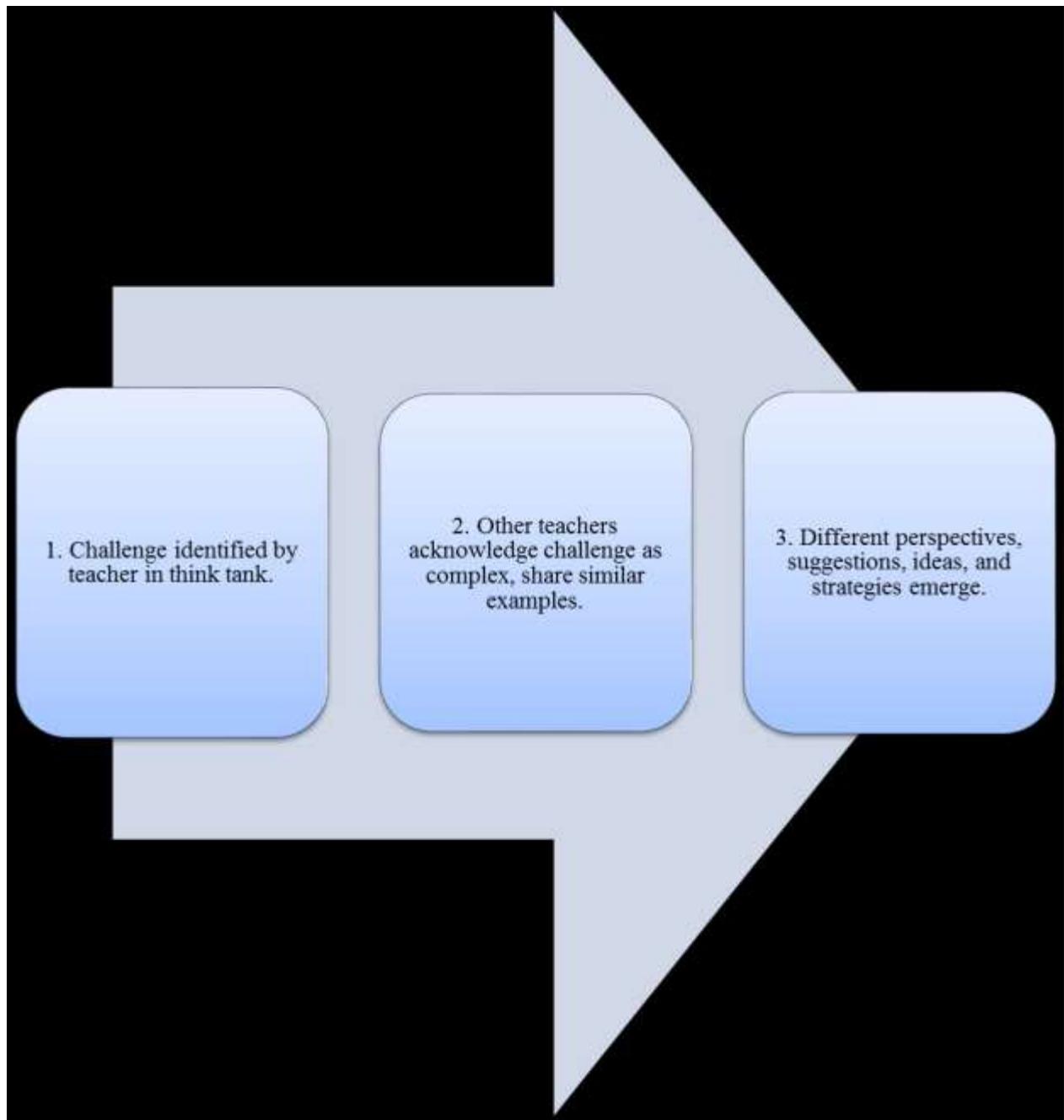


Figure 1. Think tank pattern of contending with each challenge.

Pink (2009) stated that job tasks can be divided into two categories: “algorithmic” and “heuristic” (p. 29). While an algorithmic task is one that has some easy-to-follow instructions, or an algorithm, to help a person complete the work, a heuristic task is just the opposite. That is, in order to solve a heuristic problem or issue, Pink (2009) noted that “you had to come up with something new.” It seemed that the teachers were independent in many respects because a number of the challenges they faced were heuristic in nature. Interestingly, Pink (2009) – who studied economics – appeared to be in agreement with Levitt and Dubner’s (2005) view that economics “wasn’t the study of money,” but rather, “the study of behavior” (p. 25).

As indicated earlier, participants described several instances of this independent (or heuristic) spirit, when they relied upon their own skills, efforts, and finances to accomplish their objectives. In the classroom, teachers reported how they personally sought out different strategies (e.g., finding ways to respond to multiple intelligences, creating democratic classrooms, or building individual students' skill sets), and incorporated them into their specific subject areas.

As well, the educators relied upon their own independence to achieve successes outside of the classroom. One teacher mentioned some monetary obstacles he encountered when attempting to organize a field trip, while another described innovative efforts to find funds to finance a breakfast and lunch program. One educator in the group once baked bread for his students every day for an entire school year. Yet another shared that making a school team successful required him to be at work by 7:00 a.m. every weekday. Personal time outside of the school day was often sacrificed so that teachers could independently achieve positive results. Again, those in the think tank seemed proud to share instances of finding their own homegrown approaches to solving dilemmas.

Final thoughts

What's In a Name? I believe that referring to my teacher focus group as a *think tank* subtly yet substantially changed the power dynamics of the group. This model allowed for the participants (and not the researcher) to play the role of "expert." I wasn't just seeking out teachers' opinions – I was asking them for *advice*. In this regard, this think tank approach was productive because it empowered the teachers to speak freely and confidently on the issue of helping kids graduate.

In my view, using the think tank model helped to encapsulate some of the concepts, methods, and practices these teachers successfully incorporate into their classrooms. I also think it empowered the participants to view themselves as autonomous sources of ideas and expertise, evaluators of policies and programs, and authoritative sources of information and opinion. Most importantly, I feel that this study did not just *capture* the voices of teachers, but *honored* them. Based on the treasure trove of information that these educators provided, I believe that adopting a think tank approach to identifying and addressing issues has important possibilities for classroom practice, improving schools, and sparking system-wide change.

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About the Author

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What if Musical Skill, Talent, and Creativity were just a Matter of Memory Organization and Strategies?

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Abstract

This article discusses musicians' skill, talent and creative aptitudes, focusing on musical reading and musical performance. Inter-individual differences between expert and non-experts are discussed in terms of specific encoding and retrieval strategies that are described in expert memory models.

Keywords: musical reading; expertise; competence; talent; creativity; eye tracking.

The old debate between nature and nurture in music expertise (Howe & Sloboda, 1991; Gagné, 1999) has been recently reactivated (Hambrick & Tucker-Drob, 2015). What accounts for the variability of musicians' skill, talent and creative aptitudes? According to Ericsson, Krampe & Tesch-Romer (1993) and their notion of deliberate practice, expertise may be acquired through repetition, practicing many hours per day, rather than by a supposed innate ability. After having asked expert violinists and pianists about the amount of time they practice every day, these authors observed that musicians had accumulated at 20 years old, 10,000 hours on average. This amount of time was thousands of hours more than the average for less skilled musicians. They argue: "*many characteristics once believed to reflect innate talent are actually the result of intense practice extended for a minimum of 10 years.*"

In contrast, for Hambrick & Tucker-Drob (2015), musical skill is for a large part genetically determined: nature and nurture interact with each other. Using the National Merit Twin Sample, they ran correlation analyses concerning genetic and environmental effects according the level of music practice and accomplishment, investigating whether musical accomplishment is determined by genetic factors or/and extensive practice. They used gene-environment-correlation (rGE) to enhance genetic influences on individual variations in individuals' exposure to a specific environment (for review Rutter, Moffitt & Caspi, 2006). They assert: "*Focusing on musical accomplishment in a sample of over 800 pairs of twins, we found evidence for gene-environment correlation, in the form of a genetic effect on music practice. However, only about one quarter of the genetic effect on music accomplishment was explained by this genetic effect on music practice, suggesting that genetically influenced factors other than practice contribute to individual differences in music accomplishment.*" They found that accomplished musicians are those who practice much more than others, but also that genes have a larger influence on musicians who practice.

Meinz & Hambrick (2010) claim that deliberate practice is necessary but not sufficient to explain individual differences in musical expertise. They proposed to musicians to perform a sight reading task in which pianists played pieces of music without preparation. Regardless of the deliberate practice, they observed that pianists with a high level of working memory capacity performed better than others.

Would it be possible that skill, talent and creativity were just a matter of memory organization and strategies? More precisely, are skill, talent and creativity the result of specific encoding and retrieval strategies that are described in expert memory models? That is the point of this

paper, focusing on musical performance rather than the musical composition, although this distinction is blurred in improvisation.

It has been shown that models of expert memory may shed light on musical reading and performance (Drai-Zerbib & Baccino, 2005). But what about virtuosity? Motor virtuosity represents fast, dexterous, accomplished, precise motor actions of highly skilled musicians (Altenmüller, Wiesendanger & Kesselring, 2006) as a result of intensive practice (Furuya, & Altenmüller, 2015). Many years of academic teaching and intensive practice may provide skills to the musician, but talent and creativity will be also necessary to build up virtuosity. Often, virtuosity refers to expert performance but not necessarily creative delivery of the music. Here we contrast “academic” giftedness (virtuosity) and giftedness as an original way to interpret a piece of music. According to Walberg (1988), talent is “*the outstanding mastery of systematically developed abilities, called competencies: knowledge and skills.*” Talent is also defined as the potential for achievement and the capacity to learn relevant material (Gardner, 1983, 2011).

Gagné’s definition of talent and giftedness (1998) applied to music is: “*Musical talent is the demonstration of systematically developed abilities in the playing of a musical instrument at a level which places the individual among the top 10% of peers having similar training. Musical giftedness designates the possession and use of natural aptitudes in domains that influence the development of musical talent*” (Gagné & Blanchard, 2004). According to Sternberg & Lubart (1995) creativity is “*the ability to produce original work that fits with the context and responds to task constraints.*” Actually, talent and creativity are the main challenges for a virtuoso musician: he or she must be able to produce an original piece of music or classical piece of music in a unique way although this piece has been played by other musicians often hundreds of times. Each time a virtuoso musician faces a new piece to play, he or she has to deal with a new situation which requires active problem solving. One of the main problem solving concerns is fingering patterns.

The musician has to find the best fingering patterns to use. Musicians have acquired knowledge of fingering rules and procedures but also a procedural knowledge of a wide range of fingering patterns by doing technical exercises. These fingering patterns could be applied on similar note patterns in sight reading. However, sometimes the musicians can choose to use an unusual or uncomfortable fingering pattern if it allows him to intensify the musical expression of a passage (Gellrich & Parncut 1998). The best fingering depends also on the piece, the style, and the period. The musician must be able to make the most of his instrument in order to express shades and emotions, to translate musical language and context. Thus, the musician must be able to apply familiar situations, trained during thousands of hours of practice on an instrument, in new ways, with respect to the demands of the piece of music, in compliance with composer’s intentions. He or she has actually to realize a production which is appropriate, i.e. adapted to the context, but which is new: original, unusual, and somewhat unexpected. Creativity will depend on many mental operations, but also on emotional (emotion, motivation, humor) and environmental factors.

Thus expert memory may explain inter-individual differences between virtuoso musicians who are able to play a well-known piece of music in their own way, using stored musical knowledge in a creative way. It is a real challenge for a musician to use the context to anticipate musical passages which are going to follow. The musician spends hours to practice scales and arpeggios so that he or she can easily recognize them during sight-reading. Also, the knowledge acquired concerning musical structures (harmony, counterpoint) allows musicians to use the context to anticipate the continuation of certain passages (Sloboda, 1978). In this time, concert pianists assert that atonal compositions are more difficult to memorize than tonal compositions doubtless because they cannot be guided by the rules of musical syntax (Miklaszewski, 1995). Indeed, musical improvisation in jazz music can be considered as a prototypical form of creative work in which long term working memory might be involved. As the use of natural language, the process of improvisation relies on mental processes that predicate new combinations of elements (harmonic, rhythmic) within a relevant context (Limb & Braun, 2008). During jazz performance, when musicians have to improvise a novel solo, they use the

chord structure and the melody of a composition. Pierre Boulez said (2014, p.425): “*The improvisations are based on a vocabulary completely assimilated, but used above (or below) the cohesion.*”

Considering the memory performances of certain experts who can mobilize a huge quantity of information very quickly, theories of skilled memory propose that the individuals are capable of using a part of their long-term memory (LTM) as a working memory (WM), conceiving WM as a functional subset of the LTM which is represented to the cerebral level by all the neuronal connections (For a review, see Guida, Tardieu & Nicolas, 2008). By studying the impact of a mnemonic method for increasing memory span, Chase and Ericsson (1982) proposed a skilled memory theory. Their major theoretical point is: “*one important component of skilled performance is the rapid access of a sizable set of knowledge structures that have been stored in directly retrievable locations in long-term memory*” (Chase & Ericsson, 1982, p.55). This skilled memory theory is based on three principles: *significant encoding, retrieval structure and acceleration* that drive exceptional memory performance³³ and can explain how college students were able to increase their performance on a digit span task from 7 digits to over 80 digits, after extensive practice. 1) The *significant encoding* allows an individual to organize and encode the information to be learnt in a significant way: information is encoded into LTM in terms of prior knowledge. After building a huge base of knowledge, the individual relies on this prior knowledge to encode the presented items and store the items as encoded groups in LTM. 2) A separate LTM knowledge structure (a meta-structure), called a *retrieval structure* is used to keep track of the order in which the information was presented. Retrieval structures are hierarchically organized. The encoded information is linked by retrieval cues between the contents of short-term memory and a terminal node. These retrieval cues can later trigger retrieval from LTM. 3) encoding and retrieval speedup with practice: This *principle of acceleration* refers to increased performance and speed of memorization thanks to the training. Based on Chase and Ericsson (1981), most of the theories for expert memory have granted a crucial role to both the organization of the knowledge in memory and the retrieval structure (Ericsson & Staszewski, 1989; Ericsson and Kintsch, 1995; Ericsson & Lehmann, 1996).

One of them, the Long-Term Working Memory theory (LTWM, Ericsson & Kintsch, 1995) is appropriate to explain how expert musicians manage the constraints of musical reading and execution with visible ease (Williamon & Valentine, 2002; Drai-Zerbib & Baccino, 2005). This theory is based on the three principles of Chase & Ericsson, but generalizes the retrieval structures in various domains: chess, medical diagnostic, problem resolution, computer programming, mental calculation, text comprehension, and music, and clarifies certain mechanisms. Three crucial points are underlined: 1) every activity shapes a type of retrieval structure, 2) the retrieval structure emerges from the interaction between the individual and the type of task, 3) for the expert, his LTWM is only usable in his or her specific field of expertise. Indeed, to perform some complex cognitive tasks, the necessary information to reach the goal has to remain available and easily accessible throughout the execution of these tasks. A high-level process can use the information stemming from a lower-level process if this information stays available for a minimum duration. This availability is possible thanks to specific processes in memory, called buffers, containing the results of intermediate processes. The memory creates buffers containing the results of the intermediate processes during a certain duration and there are complex processes at various levels of analysis, starting at the sensory level for every cognitive state. For example, during text reading/comprehension it is necessary to remember the objects and subjects mentioned to which the pronouns refer. In music reading, although the structure of the language is different, it is also necessary to maintain in memory the information related to the context in order to integrate each musical phrase in a coherent way. In classic theories of memory, these criteria of availability and accessibility are only gathered in working memory. Still, the classic definition of working memory is very restrictive: that is, the temporary storage for a short period of

³³ Exceptional memory performance being considered as acquiring encoding and retrieval skill without assuming exceptional capacity.

the information under process, without recovery or reactivation, regardless of the cognitive activity (Baddeley, 1986). So the capacity of this model of working memory is too limited to underlie the various mechanisms involved in expert reading. How does it work? LTWM is described as follows in the original article (Ericsson & Kintsch, 1995, p. 211)

“...A general account of working memory has to include another mechanism based on skilled use of storage in long-term memory (LTM) that we refer to as long term working memory (LT-WM) in addition to the temporary storage of information that we refer to as short-term working memory (ST-WM). Information in LT-WM is stored in stable form, but reliable access to it may be maintained only temporarily by means of retrieval cues in ST-WM. Hence LT-WM is distinguished from ST-WM by the durability of the storage it provides and the need for sufficient retrieval cues in attention for access to information in LTM.”

In other words, the theory of LTWM proposes that working memory is an activated part of the long term memory and a part of the LTM can be used as a working memory, through retrieval structures based on cues, which are the core of this theory. LTM is used as an extension of working memory, in high demanding specific domains and activities, after intensive training.

Two mechanisms are necessary in this LTWM theory: the short-term working memory mechanism (STWM) and the long term working memory mechanism (LTWM). The implementation of retrieval structures allows the use of a part of the LTM as working memory. The STWM is a working memory (WM) with a small contribution from the long term memory (LTM) providing an attentional focus of 3-5 items. The STWM maintains the information used as activated retrieval cues. Those cues are actionable according to the characteristics of the retrieval structure and allow information in LTM to be reached quickly and reliably. LTWM is the part of LTM which is accessible via the information in STWM. A single retrieval using a retrieval cue in STWM can make available the activated part of the LTM. Thus, the available items in STWM are retrieval cues capable of retrieving the part of the LTM which is connected to them by the retrieval structures. The first important point is that information in LTM stays accessible at the start and until the end of the processing thanks to the retrieval structures. Thus LTM is conceived as a storage center during processing. The second important point is that encoded information is stored in a stable way in LTWM and the access to this information is temporarily maintained by retrieval cues in STWM, though a certain quantity of retrieval cues is necessary to access to the information in LTM.

The LTWM theory includes two types of cue-based retrieval structures (Ericsson, & Kintsch, 1995, p. 220):

“...cue-based retrieval without additional encodings and cue-based retrieval with an elaborated structure associating items from a given trial or context. The demands a given activity makes on working memory dictate which encoding method individuals are likely to choose so as to attain reliable and rapid storage and access of information in LT-WM. This encoding method, which is either a retrieval structure or an elaborated memory structure or a combination of the two determines the structure of the acquired memory skill.”

Thus, items available in STWM become cues likely to retrieve the part of the LTM which is connected to them by retrieval structures. A cue in STWM can make available the active part of the LTM. The storage in LTWM is thus unlimited but specifically present in experts who are used to perform a given complex task. Moreover, retrieval structures are formatted according to the activity of expertise and can only be used in this activity. There is thus a wide spectrum of structures according to different needs inherent in a task. This diversity of retrieval structures is due to the fact that they are built in interaction with a type of task (Ericsson & Kintsch, 2000).

This theory is supported by studies in different domains (Guida & Tardieu, 2005; Kintsch & Mangalath, 2011; Drai-Zerbib & Baccino, 2014). Pesenti et al. (2001) contrasted with positron emission tomography (PET) complex mental calculation to memory retrieval of arithmetic facts of a

young expert calculator (able to quickly and accurately solve complex mental calculations) compared to non-experts. They found (p 103) that:

“an expert could switch between short-term effort-requiring storage strategies and highly efficient episodic memory encoding and retrieval, a process that was sustained by right prefrontal and medial temporal areas” and claimed (p 106):

“the present neuroanatomical results thus, strongly support the theoretical framework of the Long-term working memory. We show that high-level expertise—here, calculation expertise—results in processes and brain activations not present in non-expert calculators. In addition, the use of long-term episodic mechanisms to expand the limitation of the short-term working memory partly accounts for high-level expertise.”

In the domain of music, long term working memory theory can provide explanations about inter-individuals' differences in music reading and performance. This suggests that skill, talent and creativity might be largely a matter of using strategies to retrieve efficiently and recycle knowledge stored in memory. Tonal musical writing is driven by harmonic rules and codifications (Danhauser, 1996) that seem to belong to retrieval mechanisms described above (Williamon & Valentine, 2002; Draï-Zerbib & Baccino, 2014). Empirical studies have observed classical concert pianists preparing their musical performance; a concert pianist uses the musical structure to organize the performance and memorize a new piece of music in only a few hours of training (Chaffin, 2006; Chaffin and Imreh, 1997). The pianist relied on cues to insure information retrieval in LTM. In this case, she organized her performance according to the formal structure of the piece, compared the various themes and observed their repetitions. She stopped at the end of each musical phrase rather than in the middle of a section. Furthermore, most of the time, musicians have to memorize the piece of music they will have to play in concert. Whereas non-experts learn the piece by heart, classical concert pianists analyze the musical score in detail, writing observations about the musical elements (Aiello, 2001). Expert musicians are able to use hierarchical retrieval mechanisms to recall encoded information (Halpern & Bower, 1982; Aiello, 2001; Williamon & Valentine, 2002). They are able to index and categorize musical information in meaningful units (Halpern & Bower, 1982) which they use later when practicing or during a performance (Williamon & Valentine, 2002). Conceptual knowledge such as tonality and musical genre may be stored in memory as schemas (Shevy, 2008).

Moreover, music reading relies on cross-modal competencies. At least three different modalities are involved: vision, audition, and motor competencies are linked by knowledge of the musical structure if available in memory. While reading without listening to Bach's Sonata in trio, an expert musician is able to find out and hierarchize the different musical elements (musical form, thematic parts, dynamics, rhythm, harmony). This ability to hear music from the score was pointed out by the composer R. Schumann (1848), who advised his young students to sing at first sight a score without playing piano, and to train hearing music from the score in order to become an expert in music. If expert musicians can hear what they read from a score and represent visually the music that they are listening to, in cognitive terms, this means that an expert memory has been put into place during the years of practice. This expert memory facilitates the shift between vision and audition, and mixes both of them compared to non-expert who would separate the two types of processing. Indeed, the underlying processes in musical reading consist in extracting the visual information from the musical score, interpreting the musical structure, and performing the score by simultaneous motor responses in playing or singing, relying on an auditory feedback. As in all complex activities, expertise in musical reading is heavily related to multisensory integration which depends on individual expertise. Research on eye movements has highlighted inter-individual differences in music reading related to expertise (Draï-Zerbib, Baccino, Bigand, 2012; Draï-Zerbib & Baccino,

2014). More-skilled musicians show very low sensitivity to the written form of the score and are able to reactivate quickly a representation of the musical passage from the material previously listened to. In contrast, less-skilled musicians are very dependent on the written code and on the input modality of information. They have to build a new representation based on visual cues (Drai-Zerbib & Baccino, 2005) which can be illustrated in the different visual strategies in Figure 1 below.

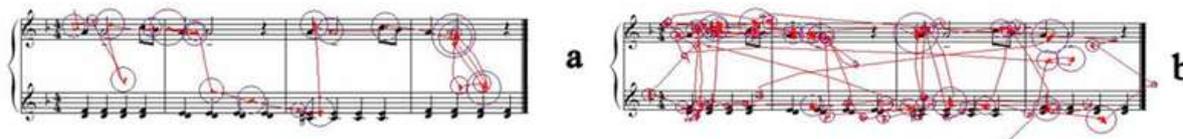


Figure 1: Experts (a) and non-experts (b). Eye movements (fixation strategies) while reading the same musical fragment.

This relative independence of experts from the score is also verified when fingering is not adapted to execution (fingering helps to anticipate by providing visuo-motor cues): experts ignore difficult fingerings annotated on the score when they have previously listened to the musical fragment, probably because they have stored the musical information in memory whatever the input source was. Conversely, less expert musicians process and apply perceptual cues even if they are not adapted for the performance (Drai-Zerbib, Baccino, & Bigand, 2012). Moreover, when expert and non-expert musicians have to retrieve a modified note between the listened music and the read music, an accent mark (a specific musical cue contributing to the prosody of the phrase), placed in a coherent or incoherent way, appears for non-experts as interference leading them to incorrect judgments (Drai-Zerbib & Baccino, 2014). So, musical knowledge supposed to be stored as retrieval structure, can be accessed very quickly from musical cues (Drai-Zerbib & Baccino, 2005; Ericsson & Kintsch, 1995; Williamon & Egner, 2004; Williamon & Valentine, 2002b). The important point is that some perceptual cues might be less important for experts because they are capable of using their musical knowledge to compensate for missing (Drai-Zerbib & Baccino, 2005) or incorrect information (Sloboda, 1984). The LTWM theory can explain differences of strategies between experts and non-experts. Tonality, phrasing and accent marks, belong to harmonic rules. These harmonic rules, represented as retrieval structures, are well grounded in the expert musician and allow individuals more efficient processing. These structures of musical knowledge are acquired with the intensive practice of music. In summary, it appears that the musical brain uses musical codes stored in memory using specialized retrieval strategies. Even in atonal music, composition relies on codifications. The composer Pierre Boulez said (2014, p. 125-126):

“There are only codes that are artificial and that we understand more and more difficultly as one moves away...The tonal phenomenon is based on certain constants; on what I call the polarization phenomena. In the tonal world, these are clearly established in one key elements and then we modulate and we move into another well-established tone. Balance, unbalance, balance. The non-tonal world is exactly the same. There are points of equilibrium which may be polarized, for example, around some notes, some arrangements. Then comes a time when we may well unbalance, a very anarchic moment then returns to other types of polarization.”

Conclusion

The very interesting question concerning skill, talent and creativity in music is a question of inter-individual differences pointing out how people use different strategies to encode, retrieve and recycle knowledge in memory. This is also a crucial question for musical teaching that might enhance individuals' creativity to capitalize on the base of knowledge stored in memory to build an expert memory, but also the necessity of deliberate practice which participates in the construction of musical expertise. A huge field of research concerning creativity and music comprehension, execution or composition has to be further investigated and innovative methods of talent identification should be developed. For example, we attempted recently to develop an objective indicator of musical reading expertise to classify musicians from their visual performances (eye movements), carried out while reading musical scores. The study (Baccino & Drai-Zerbib, 2015) used advanced multivariate pattern

analysis (MVPA) to determine whether musical reading was encoded in the eye-movement features (fixation duration, saccade amplitude, pupil dilation). MVPA has been used successfully in cognitive neuroscience to infer the content of representations encoded in patterns of cortical activity from functional neuroimaging data (O'Toole et al., 2007). It has also been successfully applied to eye-movement data to classify the viewer and the visual stimulus (Greene, Liu, & Wolfe, 2012) or the task (Henderson, Shinkareva, Wang, Luke, & Olejarczyk, 2013). Applying MVPA here uses the same logic to investigate whether the eye-movement record contains sufficient information to permit inferences about the musical reading that a person is engaged in, and by extension, to her underlying expertise.

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A Conative Approach to Creativity: The Correlation Surface of Psychopathology and Ego-strength

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Abstract

The present investigation targets the empirical validation of the correlation surface between psychopathology and ego-strength suggested by Eysenck. The sample comprised 37 middle aged adults from the Grand Duchy of Luxembourg. Established hypotheses could not be verified and results even significantly tended in the opposite direction. The findings are discussed in the light of an eventual revision of the theoretical conception of Eysenck and its potential adaptation to the measured constructs.

Keywords: Creativity; conative approach; psychoticism; ego-strength.

A Conative Approach to Creativity: The Correlation Surface of Psychopathology and Ego-strength

The *conative approach* tries to determine personality attributes, cognitive styles or motivational aspects that are necessary for the establishment of the creative process (Lubart, 2003). Regarding personality, creativity has been set in relation to the predisposition of developing psychotic disorders. This tendency is called *psychoticism*. The general conception of creative madness can only be interpreted in light of historical context and socio-cultural evolution. Even though the Enlightenment period spread the image of the sane creator, the nineteenth and twentieth century were literally craving for the mystical and unexplainable nature of madness. They were undeniably attracted to insanity. This fairly modern conception of creative genius has its roots in the Romantic Movement. However, according to Becker (2011), divine poetic mania was originally set apart from clinical insanity.

The debate about the appropriate categorization of these psychotic tendencies is still ongoing. Indeed, it has long been a recognized belief among psychologists and health specialists that the excessive stimulation of one psychological capacity is irreconcilable with perfect mental health and personal adjustment. This medical conception stands in contrast to the Romantic Era. According to Becker (2011), the Romantics' societal recognition and appreciation of the mad genius

may have resulted in a positive feedback loop of self-fulfilling prophecy. In purpose of social appreciation, artists and writers may have entered into a model of role expectations. The resulting social selection of recognized creators may have in turn reinforced the common association between genius and madness. Indeed, many creators are overtly proud of their distinctive divine madness and do not hesitate to display it publically. This again strengthens the persisting stereotypes.

In complete contrast to this, ego-strength has been identified as an essential feature in the population of creative geniuses. "Ego-strength is a person's capacity to maintain his/her own identity despite psychological pain, distress, turmoil and conflict between internal forces as well as the demands of reality" (Psychology Glossary). According to Eysenck (1995), ego-strength is best conceptualized as emotional stability, which is the opposite extreme of neuroticism.

Hence, according to Eysenck (1995), previous research in the conative domain is based on controversial theories and findings. They associate creativity and genius on one hand with self-actualization, mental health and personal balance (Adler, 1927; Fromm, 1955; Maslow, 1976; Rogers, 1976) and on the other

hand with quite serious degrees of psychopathology (Ellis, 1926; Lange-Eichbaum, 1930; Lombroso, 1891). For Eysenck (1995), the resolution of the paradox of creative personality lies in the combination of two apparently incongruent personality features: *Psychopathology* (psychoticism) and *ego-strength*. It is only at first sight that the

personality constellation of creative people seems contradictory. Even though paradox may not be the right denomination for this phenomenon, different explanations are provided. Either these incompatible traits precede creative work and favor it or they are an unavoidable consequence of creative occupations.

In the present research, it is conceived as a non-recursive interaction. Hence, these seemingly incompatible traits predate as well as result from creative work. Artists make some kind of self-sacrifice in trying to tolerate these conflicting tensions for the sake of their vocation. Throughout history artists have been known to tolerate their own mood swings and reconcile or regulate them through creative work. Eysenck illustrates this conception as following:

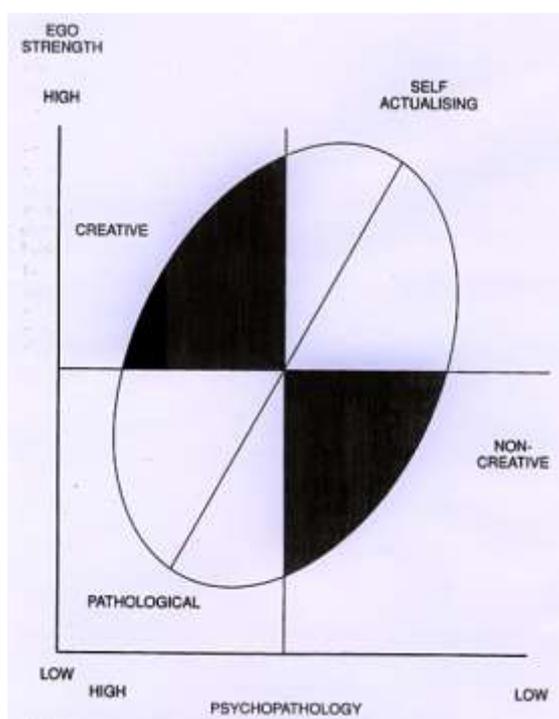


Figure 1: Correlation surface of psychopathology and ego-strength (Eysenck, 1995, p. 122).

This diagram represents a negative correlation between psychopathology and ego-strength ($r = -.60$). The majority of cases fall into the white quadrants, *pathological* and *self-actualizing*. Only a minority of people are represented by the black quadrants, *creative* and *non-creative*. When reading this diagram it is important to consider the inversion of the x-axis. Only in a sample of highly creative people, does the usually negative correlation between psychopathology and ego-strength turn into a positive one (Eysenck, 1995). This specificity is known as “controllable oddness” (Barron, 1969), meaning that creative people are both more fragile and more resilient than the general population.

This assumption was originally based on studies that investigated a combination of two normally contrasting personality features, neuroticism and super-ego control. As expected, their correlation was found to be negative in the general population ($r = -.32, p < .05$) (McKenzie, 1989; McKenzie & Tindell, 1993). However, an unusual positive association between schizothymia and ego-strength was found in a sample of eminent researchers (Cattell & Drevdahl, 1955). Furthermore, in Fodor (1995) the highest creativity level was revealed in a group of people who were both psychosis-prone and high in ego-strength. Creativity was assessed through an engineering problem

and the Remotes Associates Test (RAT). The findings were explained by a higher degree of complex visualization in people having both higher psychosis-proneness and higher ego-strength.

Taken together, the diagram represented in Figure 1 reconciles scattered and controversial findings in the conative approach to creativity. The aim of the present study is to provide empirical validation for this theoretical conception. The following hypotheses underlie Figure 1:

- (1) There is a negative correlation between *psychoticism* and *ego-strength* in the low *creative potential* group.
- (2) There is a positive correlation between *psychoticism* and *ego-strength* in the high *creative potential* group.

Figure 1 incorporates another important feature of Eysenck's theory. Whereas the correlation between neuroticism and academic achievement was revealed to be insignificant in low super-ego groups ($r = -.05$), it was found to be significantly positive in high super-ego groups ($r = .53, p < .001$). This neuroticism-superego interaction is known as the so-called Furneaux Factor (McKenzie, 1989; McKenzie & Tindell, 1993). Consequently, according to Eysenck (1995), investigations should go beyond the analysis of mere associations between personality features and achievement scores. Eysenck & Eysenck (1985) stated that those two scores would only positively correlate in populations that have been highly selected. This selection could be based either on intelligence (Spielberger, 1962) or on coping mechanisms such as superego-strength or independence (Holder & Wankowski, 1980).

According to Figure 1, ego-strength has the potential to compensate for the more pathological aspects of high neuroticism or high psychoticism. Accordingly, people who translate their creative potential into manifest work, manage to equilibrate their dispositional lack of *inhibition*. This compensatory effort results in the revelation of a remarkable creative potential. In the opposite case, these impulsive trends express themselves in the difficulty of controlling emotions and impulses.

The following hypotheses underlie the Furneaux Factor, which is incorporated in Figure 1:

1. There is an interaction between *psychoticism* and *ego-strength* in the prediction of *creative potential*:
 - a. Only in case of high *ego-strength*, *psychoticism* is positively correlated to *creative potential*.

In order to get largely acknowledged, McKenzie and Tindell (1993) consider that the Furneaux Factor needs to be replicated in future studies. So far however, no such attempt exists. Accordingly, the present investigation focuses on the interaction between psychoticism and ego-strength in the prediction of creative potential. This would provide an extension of the Furneaux Factor, by allowing its generalization from neuroticism to psychoticism as personality trait, and from academic achievement to creative potential as outcome variable. Finally, since previous investigations in the conative approach were mainly based on Big Five and Big Three personality traits, the consideration of *ego-strength* as supplementary feature is likely to provide innovative insights into the domain of creative personality.

Methodology

Participants

The sample consisted of 37 middle aged adults (20 women, 17 men, $M_{Age} = 41.03, SD = 7.23$, age range: 29-55 years). They were recruited at the University of Luxembourg and outside university. All participants were volunteers.

The mother tongue of the majority of participants was Luxemburgish (51.4%), followed by French (24.3%), German (8.1%) and Others (16.2%). The distribution of the language spoken at home was similar to that of the mother tongue. It differed only in terms of percentages: Luxemburgish (54.1%), French (29.7%), German (5.4%) and Others (10.8%).

At this point, it is important to point out that the Grand Duchy of Luxembourg is a very multicultural environment with a large immigrant background. For this reason, the mother tongue does not always correspond to the language spoken at home.

Concerning the academic background, a majority of participants (81%) had accomplished higher education (Bachelor, 35.1%; Masters, 29.7%; Post graduate 16.2%). Only 18.9% of participants possessed an education level equal or inferior to Baccalaureate. In this context, it is important to emphasize that approximately one-half of participants belonged to the University of Luxembourg. They were either students, employees, PhDs, Post-docs or Professors.

Materials

The measure of *creative potential* was realized through the Test for Creative Thinking-Drawing Production (TCT-DP) (Urban & Jellen, 1995), different sub-dimensions of Openness to new experiences from the NEO Five Factor Inventory (NEO-FFI) (Costa and McCrae, 1992): Fantasy, Ideas, and Values; and the Dominance scale from the Minnesota Multiphasic Personality Inventory (MMPI-2) (Hathaway & McKinley, 1996).

According to Urban (2005), the TCT-DP covers a more global approach to creativity than quantitative based divergent thinking tests. Furthermore, it can be considered as culture-fair/sensitive and gender fair/sensitive (Urban & Jellen, 1995). Conceptualized for a wide range of age and ability groups, this open-ended drawing test is based on several criteria: continuations; completion; new elements; connections with a line; connections with a theme; boundary breaking, fragment-dependent; boundary breaking, fragment-independent; perspective; humor and affectivity; four kinds of unconventionality and speed (Urban, 2005). A Cronbach alpha of .77 was revealed.

Openness to new experiences was assessed by the NEO-FFI. Being an abbreviated version of the NEO-PI-R, the NEO-FFI comprises 12 items per factor. They are rated on a 5-point Likert scale (with response options ranging from 1 = *strongly disagree* to 5 = *strongly agree*; i.e.: PI-R-C “*I work hard to accomplish my goals*”). The internal consistency (Cronbach alpha) for the whole Openness Dimension was .78.

Psychoticism was measured through a combination of different MMPI-2 sub-scales: Psychopathic deviate (Pd) ($\alpha = .78$), Strange thoughts (BIZ) ($\alpha = .74$), Anger (ANG) ($\alpha = .73$), Antisocial behavior (ASP) ($\alpha = .79$), Lack of self-control through inhibition default (SC₅) ($\alpha = .70$), Strange sensorial experiences (SC₆) ($\alpha = .70$) and Sensitivity (Pa) ($\alpha = .68$). According to Eysenck (1995), the MMPI is a well-known measure of psychopathology.

Ego-strength was assessed through the combination of two different dimensions from the MMPI-2: Dominance (Do) and Lack of self-control through inhibition default (SC₅) (negative pole). The *MMPI-2 Dominance scale* ($\alpha = .67$) was developed by Gough, McClosky and Meehl (1952). It covers the degree of assertiveness and directivity of the subject in social relationships. Furthermore, it reflects perseverance, assurance, cold-bloodedness, initiative taking and resolution.

In brief, it targets the evaluation of leadership capacities. The *MMPI-2 SC₅ scale* ($\alpha = .70$) meaningfully completes the assessment of ego-strength. It reflects the incapacity to control emotions and impulses. This expresses itself in moments of hyperactive excitement, uncontrollable fits of laughter and tears and episodes completely escaping consciousness and memory.

Procedure

Data collection took place at the University of Luxembourg in two consecutive time intervals. Both lasted approximately one month. Both sessions were organized in the form of individual testing, which afforded approximately two hours per person.

The participants were also offered the possibility to be tested at their own place. There was no dropout rate between both sessions. All participants were recompensed for their contribution with a little gadget.

Results

Descriptive statistics

Table 1: Mean and standard deviation for personality and creativity variables.

Variables	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Creative Potential	101.15	15.49	62	133
Psychoticism	39.84	17.90	0	85
Ego-strength	14.78	4.22	0	21

Correlations between the examined variables are depicted in Table 2. It displays a highly significant correlation between ego-strength and creative potential ($r = .43$; $p < .01$). The correlation between psychoticism and ego-strength did not reach significance level.

Table 2: Correlation matrix of personality and creativity variables in the total sample.

Variables	1	2	3
1. Creative Potential	–	.11	.43**
2. Psychoticism		–	-.20
3. Ego-strength			–

Note. * $p < .05$ level; ** $p < .01$ level.

Table 3 displays the correlation between psychoticism and ego-strength in the group of low creative potential. This correlation failed to reach significance level.

Table 3: Correlation matrix of psychoticism and Ego-strength in case of low creative potential.

Variables	1	2
1. Psychoticism	–	.16
2. Ego-strength		–

Note. * $p < .05$ level; ** $p < .01$ level.

Table 4 displays the correlation between psychoticism and ego-strength in the group of high creative potential. This correlation was negative and significant ($r = -.51$; $p < .05$).

Table 4: Correlation matrix of psychoticism and Ego-strength in case of high creative potential

Variables	1	2
1. Psychoticism	–	-.51*
2. Ego-strength		–

Note. * $p < .05$ level; ** $p < .01$ level.

Regressions and interactions

In the aim of testing the hypotheses, the interaction between psychoticism and ego-strength in regard to creative potential was investigated. This was realized by introducing the multiplication term of the z-standardized score of psychoticism and ego-strength as additional predictor. The analysis was performed by two different regression methods (Enter, Stepwise). In the end, the result of that method which excluded the least number of subjects from the analysis was considered. Table 5 represents the interaction between psychoticism and ego-strength in regard to creative potential. The retained solution refers to the method Stepwise.

Table 5: Predictors of creative potential.

Creative Potential		
Predictor	ΔR^2	β
Model 1	.20	
Ego-strength x Psychoticism		-.47**
Model 2	.27	
Ego-strength x Psychoticism		-.37*
Ego-strength		.31*
<i>n</i>	36	

Note. * $p < .05$ level; ** $p < .01$ level.

The direction of the interaction between psychoticism and ego-strength in regard to creative potential is illustrated in Figure 2.

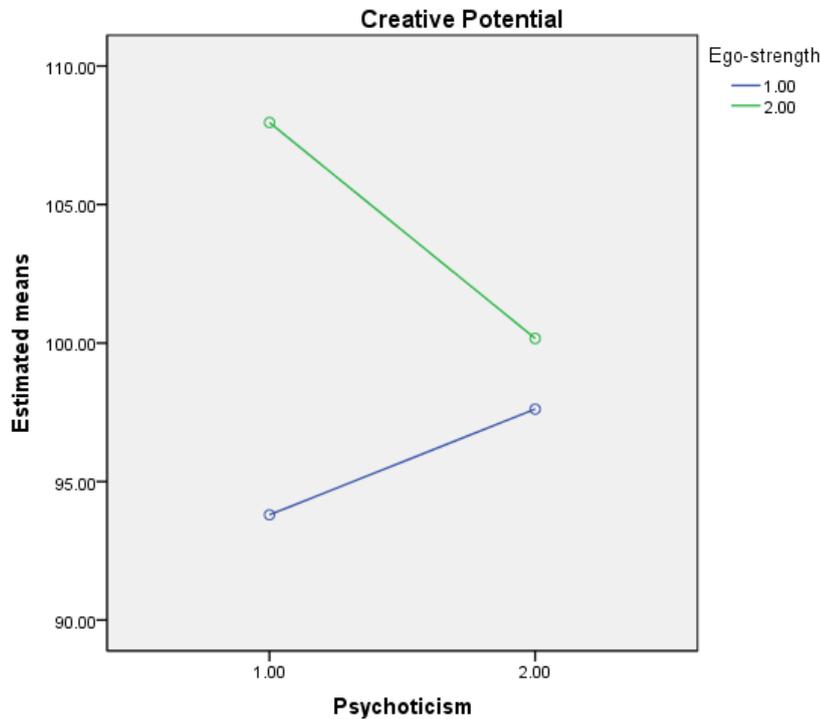


Figure 2: Psychoticism X Ego-strength.

Whereas in the low ego-strength group psychoticism and creative potential were positively related, in the high ego-strength group both variables were negatively related.

Discussion

For discussion purposes, the hypotheses will be separately examined. Taken together, all established hypotheses have been contradicted. Results even tended in the opposite direction.

- (1) There is a negative correlation between *psychoticism* and *ego-strength*, in case of low *creative potential*.

This hypothesis was contradicted. In case of low creative potential there was even a positive relationship between psychoticism and ego-strength, even though it did not reach significance level (see Table 3). Nonetheless, in the total sample a negative correlation between both variables was found but it was not significant either (see Table 2).

- (2) There is a positive correlation between *psychoticism* and *ego-strength*, in the case of high *creative potential*.

This hypothesis was also contradicted. Again results tended in the opposite direction. Surprisingly, it was in the sample of people with high creative potential that the correlation between psychoticism and ego-strength became significantly negative ($r = -.51$; $p < .05$). This stands in contradiction to the theory of Eysenck (1995), according to which the usually negative correlation between psychoticism and ego-strength turns into a positive one in a sample of people with high creative potential.

At this point it is important to keep in mind that the present sample did not include creative geniuses but essentially people with a high academic background. This means that the sample was selected in terms of intelligence. Theoretically speaking, these people should also possess a high

creative potential, by considering that creativity and intelligence are to some degree related (Silvia, 2008). Indeed, the association of both personality characteristics (psychoticism and ego-strength) was previously revealed in a sample of eminent researchers (Cattell & Drevdahl, 1955). This means that we could have expected an inversion of the correlation sign in our sample as well.

(3) There is an interaction between *psychoticism* and *ego-strength* in the prediction of *creative potential*:

a. Only in the case of high *ego-strength*, *psychoticism* is positively correlated to *creative potential*.

Also this hypothesis was contradicted. There was indeed an interaction between psychoticism and ego-strength in regard to creative potential, but it went exactly in the opposite direction as predicted by the hypothesis. Only in the case of low ego-strength, was psychoticism positively associated with creative potential. In the case of high ego-strength there was even a negative association between psychoticism and creative potential.

In the present study the Furneaux effect, which is incorporated in the theory of Eysenck (see Figure 1), could not be supported.

Nonetheless, we have to take into account that the Furneaux effect regards the neuroticism-superego interaction, whereas in the present study the psychoticism-superego interaction was analyzed. Furthermore, past studies concentrated on academic achievement and not on creative performance as outcome variable. Thus, these controversial findings could be due to the fact that the direction of the neuroticism-superego interaction cannot be generalized to psychoticism as personality trait and creative potential as outcome variable. Future studies are necessary in order to reinforce these findings and shed further light on the exact nature of the psychoticism-superego interaction in regard to creative potential as outcome variable. Eventually, the Furneaux effect has to be differentiated according to the personality and achievement variables involved.

A primary serious limit of this study consists in the restricted sample size. This problem has been addressed through the computation of the internal consistencies of the employed measurement tools, which were largely satisfying. A second specificity concerns the configuration of the sample. It contained a majority of people with a high academic background (81.1% of people have higher education). Indeed, this distribution is not representative of the general population. Hence, external validity is limited and generalization goes along with a bias. Future studies are necessary to extend those results to the general population.

Conclusions and perspectives

Taken together, the established hypotheses could not be confirmed and results even tended in the opposite direction. As opposed to the expectations, it was only in the sample of people with high creative potential that the correlation between psychoticism and ego-strength became significantly negative ($r = -.51$; $p < .05$). Theoretically speaking, both variables are supposed to be negatively related only in the general population, with a correlation coefficient varying around $r = -.60$. In people with high creative potential the association between psychoticism and ego-strength was assumed to be positive (Eysenck, 1995). However, in the present study there is no hint that this negative relationship turns into a positive one in people with high creative potential.

Ego-strength can indeed be conceptualized as moderating the relation between psychoticism and creative potential, as it was originally suggested by the theory of Eysenck (see Figure 1). The revealed significant interaction between ego-strength and psychoticism in the prediction of creative potential confirmed this result. It only seems that this interaction goes in the opposite direction as originally expected. Accordingly, it was only in the case of low ego-strength that psychoticism was positively related to creative potential. An explanation for this unexpected association is proposed by the following graph:

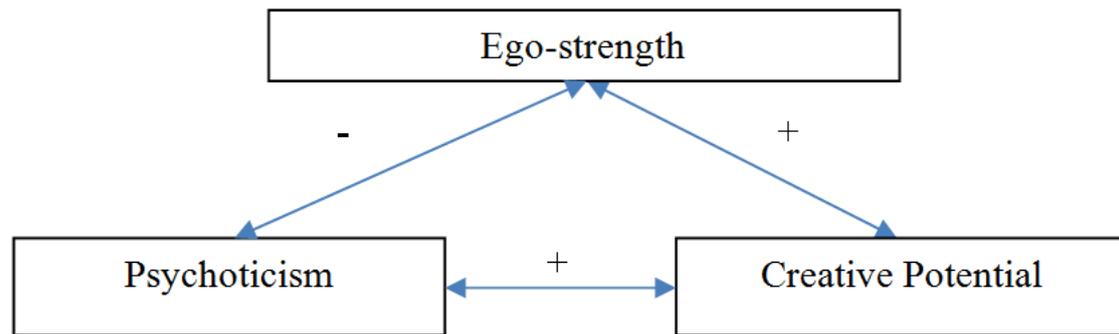


Figure 3: Relation between psychoticism, ego-strength and creative potential.

According to this graph, high ego-strength promotes creativity and at the same time reduces psychoticism. This explains the fact that only in case of low ego-strength, a positive association between psychoticism and creative potential remains (see Figure 2). In the case of high ego-strength, psychoticism gets automatically lowered and has no influence anymore on creative potential.

Based on the present findings, it is assumed that there are two different ways to creativity, passing through two distinct personality features. The first and the most important one is ego-strength, also known as emotional stability and emotional strength. This feature is the most determinant one and fosters a healthy kind of creativity, by considering its negative relationship to psychoticism. Most of the time, creativity is conceptualized as a generous and healthy kind of self-expression and as a constructive form of problem resolution, ultimately leading to self-actualization (Cropley, Kaufman, White, & Chiera, 2014). This form of creativity could be assimilated to the *Self-actualizing* quadrant in Figure 1. Self-actualizing creativity was sometimes associated to everyday creativity (Cropley, 1990), which refers to creative expression of ordinary people in daily life (Richards, 1999; Silvia et al. 2014).

The present results confirmed the prevailing role of ego-strength over psychoticism in the prediction of creative potential, at least in this specific sample of highly educated people. Indeed, in the total sample the only significant positive correlation emerged between ego-strength and creative potential ($r = .43, p < .01$). This association even stayed positive if the influence of psychoticism on creative potential and the interaction between psychoticism and ego-strength in regard to

creative potential were controlled for ($\beta = .31, p < .05$). Furthermore, the well-established positive relationship between psychoticism and creativity could not be completely confirmed in the present study. The observed correlation was indeed positive but it did not reach significance level (see Table 2). One could assume that is due to the fact that psychoticism only plays a fundamental role for creativity in artists, as suggested by Batey and Furnham (2006). It presently seems that the creation process of people with a high academic background rather relies on emotional stability and strength. They embody a more self-actualized form of creativity (see Figure 1).

According to Figure 3, it is only in the absence of pronounced ego-strength that the way to creativity leads through enhanced psychoticism (see Figure 3). This is unhealthy form of creativity which could be assimilated to the *Pathological* quadrant in Figure 1. It is characterized by a flat associative gradient, which is also typical of psychotic disorders. This refers to the so called dark side of creativity, which has gained increased attention in recent years (i.e., Cropley, Cropley, Kaufman, & Runco, 2010). It responds to the question concerning the nature of the relationship between creativity and mental illness (Kaufman, 2014; Silvia & Kaufman, 2010). This dark side of creativity is also known as negative creativity (Clark & James, 1999) or malevolent creativity, as originally suggested by Cropley, Kaufman, & Cropley (2008). Whereas negative creativity does not necessarily include a harmful intent, malevolent creativity on the other hand definitely does include one. With regard to the consensual definition of creativity, including ideas that are both novel and useful, malevolent creativity additionally requires ideas “that are intended to materially; mentally, or physically

harm oneself or others” (Harris, Reiter-Palmon, & Kaufman, 2013, p.237). To summarize, according to Harris, Reiter-Palmon, and Kaufman (2013), malevolent creativity is both original and harmful. Destructive or immoral results are deliberately provoked.

Malevolent creativity arises more often on the eminent (Big-C) or expert (Pro-c) creativity level than on the everyday (little-c) and personal (mini-c) creativity level (Kaufman & Beghetto, 2009). According to Cropley et al. (2014), malevolent creativity is comparatively more difficult to assess empirically and is currently still profoundly underexplored. According to Harris et al. (2013), emotional intelligence, an optimistic explanatory style and conscientiousness impede malevolent creativity. Seeing that specific individual differences favor or hinder malevolent creativity in divergent thinking tasks, it gets considered as a distinctive type of creativity. It significantly diverges from the common notion of creativity. Taken together, according to the authors, original and harmful ideas result from an interplay between dispositional traits, the creative process and the situation.

This dark side of creative expression can even be harmful to the world at large (McLaren, 1993). According to Cropley et al. (2008), malevolent creativity mostly applies to crime and terrorism, which often occur in times of war. The purpose of malevolent creativity is opposed to the one of traditional creativity, which is socially useful and desirable because it benefits the system. In malevolent creativity, the benevolent outcome is largely subjective, in the sense that personal gain is aspired regardless of

other peoples’ loss. According to McLaren (1999), its expression undoubtedly results in fundamental anarchism, which completely disregards social obligations and restrictions.

Indeed, according to Cropley et al. (2010), being a criminal requires some creative skills, especially when it comes to manipulating other people for personal interests. Malevolent creativity was associated to the anti-social personality disorder. Indeed, according to Eisenman, Frampton, and Gandelsonas (1974), psychopaths fulfill many criteria for unfolding anti-social creativity. Being largely freed from empathy, social concern, conscientiousness and anxiety, anti-social personalities use their keen intelligence and their superficial charm to creatively manipulate the rules of society.

Even creative people in the general population can exhibit traits that are potentially associated to malevolent creativity. According to Gino and Ariely (2012), creativity might facilitate immoral behavior in two ways: first, it allows people to conceive ingenious ways to bypass ethical doctrines. Secondly, the enhanced moral flexibility enables creative people to better justify their self-serving actions. Creative people in general have a higher probability of influencing their test outcomes (Gino & Ariely, 2012), they are more likely to be dishonest in resolving conflictual circumstances (De Dreu & Nijstad, 2008), they show less integrity (Beaussart, Andrews, & Kaufman, 2013), they have a higher tendency to be aggressive (Harris, Reiter-Palmon, & Kaufman, 2013), and they invent a higher number of better and more credible lies (Walczyk, Runco, Tripp, & Smith, 2008).

In the present research, there was no hint for the occurrence of a third form of creativity, reuniting the features of psychoticism and ego-strength. The first form of creativity being based on emotional stability and the second one on psychoticism, there should be a third form of creativity appearing in people with outstanding creative potential. According to Eysenck (1995), this exceptional form of creativity results from the convergence of psychoticism and ego-strength (Eysenck, 1995). This ideally brings about genius level creativity (see Figure 4), corresponding to the *Creative* quadrant in Figure 1.

Indeed, the present findings did not confirm this hypothesis. There was no positive correlation between psychoticism and ego-strength in the sample of people with high creative potential. A possible explanation for this finding could be the omission to include truly outstanding creative geniuses in the sample. The inversion of the correlation sign in this specific population cannot be excluded.

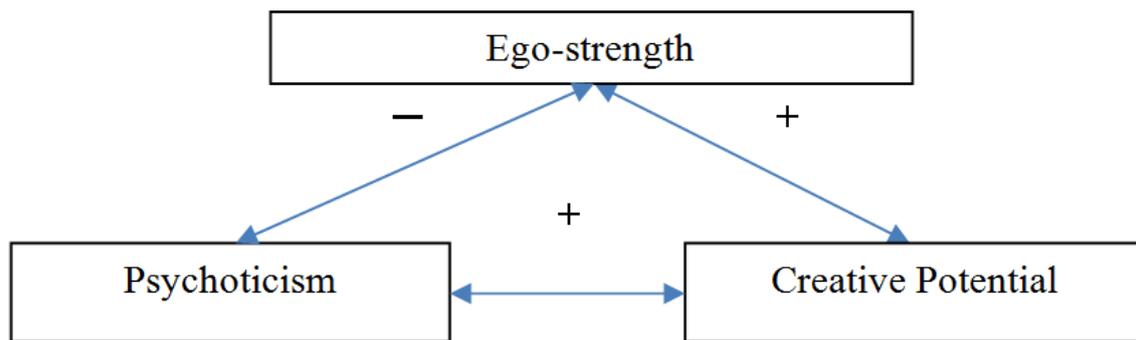


Figure 4: Relation between psychoticism, ego-strength and creative potential.

To conclude, the Furneaux effect (McKenzie, 1989; McKenzie & Tindell, 1993) may not be applicable to psychoticism as personality trait and creative potential as outcome variable. Hence, the theory of Eysenck (1995) eventually needs to be revised and adapted to those specific traits and the considered population. However, the possibility that it could hold true in a population of people with outstanding creative potential cannot be totally excluded.

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Tension in Chemistry and Its Contents

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Abstract

This article makes a case for a positive role of tension in the creative process in chemistry. I begin with an argument that there is an inherent tension in what makes molecules interesting—their positioning along various polar axes. One of these, the age-old differentiation between useful (to society and for personal profit) commercialization and pure understanding of molecules and their reactions is characteristic. The question of whether there are any bad molecules then leads me to ethical concerns in chemistry, and a particular working out of these in interactions of chemists in the Middle East. An analysis is made of the special tensions involved in publishing, especially in citation ethics; chemists publish a lot, so this is situation ethics worked out on a daily basis. I then find in the literature of psychology good evidence for the positive value of moderate stress in stimulating creativity. It is obvious that too much tension leads to distress, and there are some institutional aspects of chemistry that do not come out well here. But all in all, the dynamic middle is alive, and it leads to good new science.

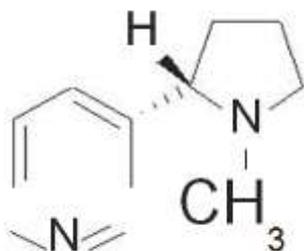
Keywords: Citation ethics; creative tension; creativity; ethics; polarities.

Most of us do not view tension positively. Every day of our lives seems to fill with deadlines, obligations. The prevailing sense is that we cannot possibly do all that we want to or others expect us to do. These feelings generate stress and make us feel psychologically uncomfortable, if not unhappy.

I would like to argue that there is another way to view tension than for its discontents, and this is as natural, even a blessing in disguise, as a source of creativity: That our profession, our chemistry, has an innate set of tensions. And that the everyday practice of chemistry generates still other tensions that (a) are in fact transmuted into greater knowledge and better practice, and (b) are important in honing ethical judgment.

Polarities shape Chemistry

My proposition in *The Same and Not the Same* was that every chemical fact is poised on the axes of not one, but several polarities, balances between extremes (Hoffmann, 1995). So the molecule of nicotine has so much more to it than its stoichiometry and atom connectivity, than it being (S)-3-[1-Methylpyrrolidin-2-yl]pyridine (1):



Nicotine is a liquid with a low melting point, one that can be easily dispersed in an aerosol (*ergo* the recent interest in and concern about electronic cigarettes). This naturally occurring alkaloid

is easy to make or not, and is a stimulant or a relaxant (it is both). Nicotine is there as a microscopic molecule, which we can “see” (or try to) with scanning tunneling microscopy or, as its salts, by X-ray crystallography. Nicotine is addictive and is used (in some smoking cessation devices) to control and eliminate smoking. A chemist might want to patent a synthesis of a derivative. Or publish it. Or both.

So many ways to think about a single molecule! Here is a partial list of the polarities along which nicotine, or any molecule, is aligned:

simple – complex
 macro – micro
 symmetry – asymmetry
 harm – benefit
 natural – unnatural
 creation – discovery
 static – dynamic
 symbolic – iconic
 pure – impure
 synthesis – analysis
 to reveal – to conceal
 trust – skepticism
 the same and not the same

Molecules reside on the many axes of chemical interest. But they most certainly do not rest easily on any. I have been thinking about writing a book that might formulate a philosophy of life out of chemical concepts. First among these, for sure, would be that most characteristic and distinguishing aspect of chemistry, that the molecule (or the property of the molecule that interests us) can change. And does change. Heraclitus was right — everything flows, nothing stands still.

Change, or the potential of change, define chemistry. The next motive idea in that far-out book might be equilibrium — which, of course, for chemists does not mean lying there, quietly. Yes, $A + B \rightarrow C + D$. But at the same time, all the time, $C + D \rightarrow A + B$. We are not talking of two molecules—in any drop of a solution there are 10^{19} of them, all moving madly, colliding frequently. At equilibrium there are some A and B molecules, some C and D ones; there may be little of any one molecule, but it is there. In its sealed ampoule, the compound just looks placid and static at that middle point, the concentrations of what made it up, and what it may react to not changing. But it is a dynamic middle, the world of those molecules, and not just in their chaotic molecular motions, but also ripe with potential. Do you want to have the reaction go one way, or the other? We can perturb that equilibrium.

Change, or the potential of change (the molecule modified to be more or less addictive, more or less soluble) creates tension — the molecule refuses to sit still in reality, and in our mind’s eyes. And still other tensions may take shape in the minds of the practitioners of chemistry, as they go about their professional labors.

Pure and applied

Those attributes are enshrined in the name of IUPAC, the International Union of our science. They describe a particular tension that animates chemistry, in that the products of our science have a direct impact on the human condition. One can expend many nice words in justifying knowledge for the sake of knowledge, but from the beginning, before there ever were chemists, people did chemistry for profit. So Egyptian blue was used in brickwork of the Gate of Ishtar, and Chinese blue, a related pigment (both with Cu^{2+} as a chromophore) was employed to decorate the Xi’an army (Berke, 2002). Protochemistries of winning metals from their ores, making alloys, cooking, preserving food, fermentation, distillation, of preparing medications, ceramics, dyes, textile preparation, cosmetics, tanning, mummification, in time turned into industries.

The economic and military interests of governments or patrons always were a driving force for research. We can see this in Duke Augustus of Saxony financing the remarkable European rediscovery of Chinese porcelain in the first decade of the 18th century (Hoffmann, 2004b), or in Lavoisier's work on assuring a supply of nitrate for gunpowder for royal and republican France (Poirier, 1996). An argument could be made for American laser chemistry benefitting from "star-wars" ideas (the Strategic Defense Initiative) in the 1980s. And today some pretty chemistry rides unrealistically, with easily recognizable, almost comic verbiage decorating the beginning and endings of papers, on the tails of present concerns about hydrogen storage or high energy capacity materials.

But then there is another thread of argument in our time, that of doing science, and chemistry in particular, for the purpose of advancing knowledge—the "pure" in "pure and applied." Science for science's sake is possibly a 19th century idea, connected to the growth of universities away from being religious institutions. In modern times the justification is often made in terms of eventually commercialized advances, such as the transistor, lasers, or polymers, which had their origins in fundamental research. Lives have been saved, our condition ameliorated, by molecules that emerge from a basic research program.

It is a tension I feel personally. For I made a conscious choice for understanding rather than practice. But I feel guilty about it, in that I could be doing something more useful to humanity. My concerns are lifted, barely so, when I see that many pharmaceuticals patented, synthesized, and marketed using ideas in their synthesis of which reactions might go easily and which might not be based on the Woodward-Hoffmann rules or frontier orbital thinking. I, who do not "own" a single patent, can then feel that I am helping, without running after the money. But underneath I know that what keeps me thinking up new molecules is just the fun of it. And that I can parlay that fun into a broader framework of chemical bonding that (a) is useful; and, (b) can be taught.

It is easy to see that the current rush to commercialization of discovery out of chemical (and medical and engineering) laboratories can lead to other tensions. I worry, and so do others (Kovac and Coppola, 2000; Coppola, 2001) that the graduate students working in a group with a professor who has one or more startup companies may have their education distorted by that, even if the commercial activities are separated from the government-sponsored academic research. I know my worries are those of an outsider. But, as Jeff Seeman reminded me, that self-description itself is a tension — I am also an insider, very much in the chemical community, reflective and willing to speak out on how chemistry is taught and used.

Are there any bad molecules?

The first answer is "no, there aren't any bad molecules"—only bad people. The point is more interestingly made in the context of molecules that both heal and harm — of ozone and morphine. Ozone is a harmful pollutant at sea level, and a saving filterer of UV radiation in the stratosphere. Morphine is our most wonderful painkiller, and very addictive.

The "no bad molecules, only bad people" slogan, of course, evokes the argument of the anti-gun-control lobby. Is it right to ban guns, or to ban molecules? My opinion is that under our unspoken social contract, society has the right to ban both. It should exercise that right with care.

Let me be specific, and speak about thalidomide. You know that terrible story of the unscrupulous marketing of a potent teratogenic agent. I describe it in my book *The Same and Not the Same* (Hoffmann, 1995). In the sequel, in the 1960s the world spoke clearly "never again," and put into place laws and regulatory regulations to ensure that.

And now the FDA has approved the manufacture of thalidomide in the United States. It can be prescribed for complications of hanseniasis (leprosy) and there are indications of antitumor activity. The approval came with the most stringent warnings attached to its use, and precautions against misuse.

My personal opinion, with which some surely disagree, is that I think the molecule should have been banned. Why?

Well, another country (Brazil) has tried the experiment of limited licensed use against leprosy, while taking measures to warn and monitor patients against use by pregnant women in the first trimester. Nevertheless, the drug has been misused, in a variety of circumstances, and there are apparently several dozen documented recent thalidomide-deformed births (Estado de S. Paulo, 1994).

Perhaps the medical system in the U.S. is better than in Brazil, so misuse could not occur here. I am not that sure. My opinion is that some potential effects of a pharmaceutical have moral consequences of a nature such that the normal and agonizing risk equation (benefit to some vs. potential harm to others) just cannot be used. Risks to infants and children, the repositories of the future of humanity, to me constitute such an unacceptable risk. This drug should not be licensed, in my opinion, under any circumstances.

Instead, pharmaceutical researchers should be given incentives to develop thalidomide-related molecules which are effective but do not cause birth malformations.

You need not agree with me. But I think there are very few extreme libertarians who would argue that governments do not have the authority to constrain the making, sale, or consumption of one molecule or another. Think of angel dust. Think of hydrogen cyanide. There are no evil molecules, but governments can forbid people to make certain molecules.

Ethical concerns

The previous two sections have shifted subtly from scientific tensions to ethical ones. These are ably discussed by Jeff Kovac elsewhere in this issue of *Accountability in Research*; the community owes Jeff much for his dedicated discussion of ethics in scientific research, and in particular for writing the one and only case book in our field (Kovac, 2003).

It has been my fortune to be faced with thinking about not one but many ethical situations — how to deal with E. J. Corey's claim to have given R. B. Woodward the first, simplest frontier orbital explanation of the specificity of electrocyclic reactions (Hoffmann, 2004a); what to do with the claims of Peter Debye's having cooperated with the Nazi regime (Hoffmann, 2006; Abruña, 2006); how to react to a IUPAC-sponsored conference in Jordan that excluded Israelis (for a report I view as biased, see Rouhi, 2010). I do not say "my fortune" ironically; it is a statement of fact. Even as there are moments when I think that I wish I had been spared, actually I am grateful to have been impelled, by the circumstances in each case, to think. For ethics needs exercise; it needs discussion among friends and with people who disagree. Ethical judgments are deeply personal and existential. And easy only in textbooks. In the real world, ethical concerns need to be worked out in personal conversations.

I have discussed elsewhere the Corey claim, and the Debye case, and written more generally of ethics in science as we enter the third millennium (Kovac and Weisberg, 2012). Here, I want to enter some of the ethical tensions that arise from science being a collegial international practice, yet one moored in the real world.

Collegiality and the Middle East

One of the unresolved political tragedies of our time is the inability of Israel, Palestine, the surrounding Arab countries, and Iran to reach a *modus vivendi*. The matter is of personal interest as I am from a Polish Jewish background, and have many relatives in Israel — some who went there in the 1920s and 1930s, some after World War II. Believing in the legitimacy of Israel, and with pride in its achievements, I have watched with great disquiet its political actions in occupied Palestine. And like many others, I have wanted to do something, be it small, to help bring about peace in the region.

So it has been a great satisfaction to take part in the Malta conferences, running for over a decade now, existing only by the dint of Zafra Lerman's great energy (Everts, 2013; Hoffmann 2014). The conferences, held not only in Malta, bring together chemists from the Arab countries, Israel, and Iran. The plenary lectures were mostly by Nobel Laureates — that affectation was deemed a necessity — workshops, discussion groups, and posters came from all countries.

Cordial, interactive, and informative as they were, there was naturally some tension in the air at the meetings, for politically charged issues, such as the control of water rights, were discussed. Descriptions were given of the indignities to which Palestinians were subjected in passing from one part of their land to another. And there were chilling reports at the last meeting of a Syrian colleague killed, of students trying to do labs with gun fire around them.

Encouraged by the Malta conferences, I organized three workshops in 2006 and 2007 in the Middle East, with 15 young (under 35) scientists in each, mostly graduate students, from the Arab countries, Israel, and Iran. I was helped in this by Pere Alemany, Vanessa Buisson, Steve Lippard, Ralph Nuzzo, and George Whitesides. And hindered by politics, of course. We had to have the workshops in places where Israelis and Arab country nationals could meet, and that meant Jordan or Egypt; we almost talked Qatar into hosting one, but in the end they would not allow it. But we could not get Iranians into Egypt, so poor were the relations between the two countries.

The attraction to the participants was the stellar science proffered — who would not want to learn bioinorganic chemistry from Steve Lippard? There was a bonding mechanism, the Marine Corps principle — work the group so hard that they forget their differences and bond through survival. I think it worked. But in the years that followed, the political situation in the region deteriorated, and I could not raise the money I needed for further workshops from the Arab sources that were needed for legitimacy.

In 2010, I noticed that the 11th Eurasian Conference on Chemical Science was to be held in Jordan, and had a hundred speakers listed but not a single Israeli. That was a conspicuous piece of politicized prejudice; it was as if there were a chemical congress in Belgium, and no French scientists were invited. You cannot imagine that, right? If I raised a stink about this, there would be a severe risk to my efforts to raise support for my workshops. But that is what I did.

In the process I encountered incredible moral blindness by others to what the obvious (at least to me) political exclusion of Israeli chemists meant. So Nicole Moreau, then the President of IUPAC, wrote to me, “explaining” why IUPAC had no problem with sponsorship of the meeting:

In no case is the choice of invited speakers an element that has to be taken as a criterion for sponsorship. On another hand, if we look at the list of invited speakers, many countries are not represented, for instance Spain, which could be surprising for an Eurasia conference: we noted no complaint from any Spanish chemist! This could be put in parallel to your example about Korea and Japan. And there is nobody from Latin America
...

I do not intend to ask the organizers why they did not invite speakers from Israel. I trust you to understand that this is not a personal decision, but that this is because it is not the role of IUPAC to interfere with the organizers' choices and decisions. I realize, however, that these choices and decisions cannot give satisfaction to everybody, considering the very delicate situation in the region (Moreau, 2010).

My small efforts in the Middle East are, in the end, inconsequential. In the context of my theme of tensions, there is precious little life-giving here, mostly the petty political perversion of the internationalist aspiration to scientific knowledge being shared by humanity. I still feel that the shared quest for knowledge to benefit humanity spiritually and practically is one light that can lead us out of

the dark spirals of prejudice that politicians are all too good at swirling in our souls. It is worth trying, as tense as it gets, for the middle way.

The continual exercise of situation ethics in chemical publishing

We are not yet done with ethics; how can we be? I would, however, like to shift to the positive aspects of the tensions pervading science, with a case for the particularity of chemistry in the shaping of ethics by our publication practices.

Chemists publish much and often. On the scale of science, I suspect only molecular biologists can “compete,” but then they are really chemists as well. Chemical Abstracts indexes over 700,000 articles per year in chemistry and related fields. I suspect that a good half of these are what people would agree is chemistry, i.e., about one thousand a day. My RSS (Rich Site Summary) aggregator brings in the abstracts of ~100 journals, about 1,500 articles weekly; this is what I feel I must read (well, glance at) to keep up. All of us know colleagues who have published 500 to 1,000 articles. Our unit of publication in chemistry is pretty small, 4 to 10 printed—whoops, not much is “printed” today—pages, with 25–75 endnotes.

Each article is a small exercise in publication ethics. My claim is that being forced to go through the exercise, say 6 times a year, is a salutary experience for the writer/researcher, naturally shared with her or his postdoctoral visitors or graduate students. And it is an experience in which reviewers of the articles play an important role.

The situation ethics is that of giving proper credit. Jeff Seeman and Mark House have carried out an important study of the realistic practices of crediting advice and discussion (House and Seeman, 2010; Seeman and House, 2010a,b). Journal codes of ethical practice give wise but general guidelines that apparently are not widely used, at least by chemists (House and Seeman, 2010). But in the end, the discussion of acknowledging prior history of a problem and forerunners in theory or experiment is a very personal one, often taken by the lead author, sometimes in consultation.

External pressures may influence the decision. The journal *Nature*, for instance, limits the numbers of references per article. You can be a very good, recognized scientist without ever publishing in *Nature*, but go tell a young Chinese chemist that! There are also special

problems (mostly in the past) with more that laziness making people cite reviews rather than source articles. Of Americans ignoring literature published in other languages, and of nothing Jeff Seeman also reminded me of the idea of “obliteration by incorporation,” that way. As long as there is an occasional reminder that a real live person introduced by our mutual hero, Robert K. Merton (Merton 1968). Some ideas in science (and phrases in writing) are as intellectually attractive and/or useful as to become seemingly self-evident, needing no citation. Languages clearly grow thought of that first, no great harm is done in science by this phenomenon. Perhaps one could even aspire to be obliterated in this way!

Let me interpose here a personal experience to show the complexity of the problem of just citation. Maosheng Miao and I have just written what I think is an important article on high pressure electrified, which is in *Accounts of Chemical Research* (Miao and Hoffmann, 2014).

Accounts of Chemical Research is a place for personal reviews of mainly one’s own work — a situation of the research in the surrounding literature is expected, but not a systematic review. Nevertheless, I felt the pressure to reference previous work. Here was, for instance, Jim Dye’s beautiful work on alkali metal ambient condition electrified. But our article was on high pressure materials, beasts of a different stripe. I felt guilty (and said so in the article) about having to relegate most of the references to Dye’s work to the Supplementary Information of the article.

Another beautiful body of work by Arndt Simon on alkali metal suboxides and subnitrides, Swiss-cheese metals, was also not directly relevant, and mentioned only briefly by us. But other people had more or less ignored the Simon work — was it our place to correct in our brief tour through previous work the unjustified

omission of Simon's work by others? We found a right word to hint that this had transpired.

When we sent a preprint to a colleague whose work we had mentioned, a prime researcher in the field, he told us straight up that he was unhappy that we had not mentioned that he was the first to mention the electrified concept in the high pressure literature. Fortunately, his complaint came as we were reading proof. We fixed it, went to second proof. At this point, by tracing a reference we should have followed earlier, we found another article in which the idea of an interstitial electron density was forwarded by a still different group, prior to the complainant. The matter was not expressed in direct chemical language, i.e., the entity was not called an electrified by name, but it was clear to me they had the idea. That too had to go in.

I stopped at third proof. And thank you, ACS Publications Department, for not billing us for the work we created via the extra galleys. It is not that we did a poor literature job to begin with; my collaborator in this work probably got tired (or at least expressed some surprise) at the time I put in to go through the literature. It is just

that the literature is large, and the chains of antecedents almost divergent. And there are always forerunners, partial understandings, and inklings. Let there be no doubt: one should bend over backwards to cite these.

At times I have wondered about the peer review process. So much time spent by the community, so much aggravation generated for the authors, all to either occasion a revision, or, at the extreme, keep out a few poor articles from being published. After all, we train our students to tell the difference between a routine article and a good one. But I am now convinced that peer review is important for many reasons — most for the intangible feeling by an expert that this work makes sense, and is important or is routine, or worse (Hudlický, 2005; Carlson and Hudlický, 2012). And for making sure that the illustrations communicate — that, sadly, is where many authors fail. And, relevant to this section, that others' work is cited. To do otherwise, not to cite relevant work, especially if it disagrees with your own theories, violates no laws, but is destructive of the underlying ethics of our scientific micro-society. Reviewers are the front line on ethics of citation.

Creative tension

The idea that a certain amount of tension is conducive to creation is commonplace. One finds it often expressed in the inspirational literature of management. The usual prescription is that by articulating a vision, and contrasting it with reality, one formulates more clearly a goal, in whose determined pursuit creativity is unleashed.

The vision may be aspirational, of the heart as much as it is of the mind, as in Martin Luther King's 1963 "I have a Dream" speech, which in part reads as follows:

I have a dream that my four little children will one day live in a nation where they will not be judged by the color of their skin but by the content of their character. I have a dream . . . I have a dream that one day down in Alabama, with its vicious racists, with its governor having his lips dripping with the words of "interposition" and "nullification," that one day right there in Alabama little black boys and black girls will be able to join hands with little white boys and white girls as sisters and brothers. (King, 1963)

Or it may be direct, and chemical, as in the goal posed to U.S. automotive engineers and scientists by California's emission controls in the sixties.

King's voicing of a challenge to the United States, not just Alabama, has been met, but only in part. And catalytic chemists in Detroit, their bosses crying to high heaven that it could not possibly be done, came up with the remarkable three-way-catalyst, reducing exhaust unburned hydrocarbons, CO, and NO_x by factors of 10 to 40 between 1966 and 1993 (Calvert et al., 1993).

That is inspiration. Is there any evidence in the psychological literature for creativity enhancement under tension? A place to start is with the Yerkes–Dodson law, the recognition that

there is a dome-shaped relationship between arousal and optimal performance on a variety of physical and intellectual tasks (Yerkes and Dodson, 1908). The hypothalamic-pituitary-adrenal system reacts to stress (read perceived tension) by releasing corticosteroids, epinephrine, and, secondarily, neurotransmitters. There is an initial increase in performance with stress level, and then a leveling off, followed by a decrease. So . . . some tension is good; too much is definitely not.

At the same time, there is a world of writing that recognizes the reality or potential of growth through extreme suffering, stress that no human being should experience. My immediate reaction, as a childhood survivor of the Holocaust, is that much of this is *ex post facto* romanticization. But one cannot deny the first-hand, honest accounts of many whose lives have been changed by traumatic events. Tedeschi and Calhoun provide a sensitive analysis of the phenomenon in their article “Posttraumatic Growth: Conceptual Foundations and Empirical Evidence” (Tedeschi and Calhoun, 2004; see also Park and Helgeson, 2006). I quote from their conclusion:

[Posttraumatic growth] is likely to involve a powerful combination of demand for emotional relief and cognitive clarity, that is achieved through construction of higher order schemas that allow for appreciation of paradox. Metaphorical and narrative elements are likely to serve trauma survivors well as they take on a life that has become surprising, complicated beyond expectation, and painful. (Tedeschi and Calhoun, 2004; Park and Helgeson, 2006)

I range too far afield from what I seek — a connection between tension, a stressor, and scientific creativity. To return in stages, consider first the work of Hans Selye, the prolific Hungarian-Canadian endocrinologist, who identified “eustress,” literally “good stress.” Selye documented the way our bodies cope with stress, the hormones and organs involved. The response to tension, he argues, is not only negative, distress, but may be positive (Selye, 1976). An example might be the reward system I experience on going longer up and down our Ithaca hills on my bicycle than I ever did before. But it also may be the satisfaction of seeing B,N substitution on a naphthalene skeleton work to meet a criterion for singlet fission (no, not a new way of asexual reproduction).

Selye’s perception of the potential responses of an individual to a tension-producing stimulus by eustress or distress puts matters in a somewhat different light (LeFevre et al., 2003). There appears to be a growing literature on the positive psychological effects of stressors. I found very useful the rethinking of stress by Crum, Salovey, and Achor (Crum et al., 2013), which emphasizes the role of mindsets (that can be modified) in the formation of a “stress-is-enhancing” response. Previous studies have shown that there may be an enhancement of physical thriving in response to stress (Epel et al., 1998), and in taking personal initiative (Fay and Sonnentag, 2002).

There is also some evidence in organizational psychology that individuals experiencing ambivalence of an emotional sort (feeling simultaneously positive and negative emotions) recognize better unusual relationships between concepts, and are more sensitive to associations (Fong, 2006). Recognizing relationships, forming associations — that is a lot of what the best scientists do.

I found especially informative an account by Mark A. Runco of the ways in which “disturbance and anxiety can facilitate creative effort” (Runco, 1994; see also Smith and van der Meer, 1994). Runco reviews a variety of psychological studies that point to a moderate amount of stress in a way fertilizing creativity. Important guidelines here are provided by two great 20th century developmental psychologists, Lev Vygotsky and Jean Piaget. Vygotsky described creativity as “a benefit of conflict between realistic and imaginative conditions” (Runco, 1994, p. 112; Smolucha, 1992); and Piaget had an imaginative theory of psychic disequilibrium between what experience offers and the cognitive structures in our mind (and our imagination) proffer.

Let me be parochial: I have a schema of frontier orbital thinking in my mind; this ornery molecule behaves opposite to my “prediction.” This does not feel good, for I want to understand. I look for an explanation, of course: I want to reach the point where I could kick myself in the behind for not having seen it. That is a theory of theory formation.

Runco makes an important point, that tension can be “both a cause and an effect of creativity” (Runco, 1994, p. 119).

There is also a substantive literature on cognitive dissonance, i.e., how one deals with incompatible observations or sensations (Festinger, 1962; Aronson, 1995). Denial and self-delusion are one negative outcome. Creative adjustment is a positive one — I view Bohr’s complementarity principle as such. Bohr said that we are obliged to describe phenomena in ways that may seem contradictory (e.g., the particle and wave nature of light), always aware that these descriptions are tied to specific experiments that force those seemingly incompatible interpretations.

The history of chemistry has a number of such productive adjustments. Consider the progression from 19th century lines in chemical formulas, symbols of a chemically manipulable replacement of one atom/functional group for another, to G. N. Lewis’s shared electron pair, then reinterpreted by Linus Pauling as a quantum mechanical valence bond. The sequence of these representations is hardly an example of a

Kuhnian revolution. These world views of the chemical bond were grafts of one idea onto another, by such smart people. They improvised, *sans malice* — to escape the imprisoning dichotomous world of the either/or. Almost seamless, these appropriations of a previously existing concept (the chemical bond) were carried out with the faith that the world is one underneath, and that one day there will come a new way of seeing that will reconcile seemingly irreconcilable perspectives.

I see it also in the establishment of the equivalence at a higher level of approximation of simple valence bond and molecular orbital pictures of the chemical bond, due to Charles Coulson.

Finally, I see a piece of the relationship between tension and creation in Blume Zeigarnik’s older studies, not undisputed, of people remembering better unresolved activities (Baumeister and Bushman, 2008), or remembering them in a different way. Most of us have had the experience of an unsolved problem loitering, so to speak, in our mind, and then surfacing, unexpectedly, to be solved or resolved, at some later date, even in a dream.

And Excessive . . .

I began this article writing “Most of us do not view tension positively.” The previous section could be brought up as evidence that I see the world through rosy glasses. So I would like to reiterate here the multitude of ways in which the excessive tensions of the modern scientific world cause “distress,” to use Selye’s term (Selye, 1976).

We have, for instance created in the U.S. chemistry (and not just chemistry) an incredible machine for innovation, the Assistant Professorship. At great psychological cost—a young man or woman has to learn to teach, to attract graduate students, to do first class research, to “sell” that research and be “seen,” to serve his university and profession to get research funding, all while beginning a family.

I think one of the reasons the increasing pool of Ph.D. women chemists moves disproportionately more into the industrial rather than the academic workplace is just because of the inhumane tensions of our innovation machine.

A special tension of the great recession out of which we are working our way is that in a cure, spurring employment, American Recovery and Reinvestment Act funds increased the research pot for academic chemists. But at the same time, private universities lost parts of their endowment, and state budgets were constricted. The outcome was a 5–15% decrease in education budgets. Research up, education down, and no way to shift funds from one category to the other (Hoffmann, 2009).

One disease of the biomedical profession we have avoided in academic chemistry is that we do not have to raise our salaries from our research grants, as people in our wonderful medical schools do. Nevertheless, the pressure to get research grants, and to publish in prestigious journals is great, and in its own way, destructive of the spirit.

The tense middle

I return to equilibrium, and the idea of a tense, productive middle (Hoffmann, 2008). Productive, because it is tense. The middle is interesting. It may not be what the world wants, least of all what journalists (and that includes NPR journalists) want. “Is that hurricane the worst you’ve experienced?” Strong opinions, extremes make a good story. And . . . for the teller, the extreme is a haven, where the water is calm, where your back is secure against a wall.

What chemical equilibrium teaches me is that the middle is not static, but dynamic. And so it is tense. The middle has the potential; I have the potential; you have the chance — of going one way or another.

I like that. Yes, I also want stability. But I believe that extreme positions — all reactants, all products, all people A bad, all people B good, no taxes at all, taxed to death — are impractical, unnatural, boring, the refuge of people who never want to change. The world is not simple, though, God knows, political ads (on every side) want to make it so. I like the tense middle, and am grateful for a world that offers me the potential for change. Chemistry does.

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About the Author

Roald Hoffmann was born in 1937 in Zloczow, Poland. Having survived the war, he came to the U. S. in 1949, and studied chemistry at Columbia and Harvard Universities (Ph.D. 1962). Since 1965 he is at Cornell University, now as the Frank H. T. Rhodes Professor of Humane Letters Emeritus. He has received many of the honors of his profession, including the 1981 Nobel Prize in Chemistry (shared with Kenichi Fukui).

“Applied theoretical chemistry” is the way Roald Hoffmann likes to characterize the particular blend of computations stimulated by experiment and the construction of generalized models, of frameworks for understanding, that is his contribution to chemistry. The pedagogical perspective is very strong in his work.

Notable at the same time is his reaching out to the general public; he participated, for example, in the production of a television course in introductory chemistry titled “The World of Chemistry,” shown widely since 1990. And, as a writer, Hoffmann has carved out a land between science, poetry, and philosophy, through many essays and three books, “Chemistry Imagined” with artist Vivian Torrence, “The Same and Not the Same and Old Wine” (translated into six languages), “New Flasks: Reflections on Science and Jewish Tradition,” with Shira Leibowitz Schmidt.

Hoffmann is also an accomplished poet and playwright. He began writing poetry in the mid-1970s, eventually publishing the first of a number of collections, “The Metamict State,” in 1987, followed three years later by “Gaps and Verges,” then “Memory Effects” (1999), “Soliton” (2002). A bilingual selection of his poems has appeared in Spanish. He has also co-written a play with fellow chemist Carl Djerassi, entitled “Oxygen,” which has been performed worldwide, translated into ten languages. A second play by Roald Hoffmann, “Should’ve,” has had several workshop productions since 2006; a new play, “We Have Something That Belongs to You,” had its first workshop production in 2009.

Unadvertised, a monthly cabaret Roald runs at the Cornelia Street Café in Greenwich Village, “Entertaining Science,” has become the hot cheap ticket in NYC.

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Rebuilding, Healing and Transforming: Innovative Approaches and Promising Strategies for Children Affected by War

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Abstract

The discussion in this paper is drawn from a research program conducted in Lira and Gulu – two districts in northern Uganda that have experienced in excess of 20 years of civil war. Researchers from Uganda, Canada and the United States explored the educational and psychosocial needs of youth who are living in post-conflict situations through the use of interviews with secondary teachers, students, parents, community members, and district education leaders. The findings provide insight into how the various ecological systems support the personal, social and academic development of youth who are living in post conflict contexts. We identify some innovative approaches for uncovering the unique gifts and talents of children who are affected by conflict and war. Several school-based approaches and creative strategies are proffered as a means to facilitate healing and personal transformation.

Keywords: Healing; innovative approaches; strategies; war, USA; Uganda; gifted children.

The exploration of educational practices that contribute to the normative construction of society is well documented in the field of comparative education (Hayhoe & Mundy, 2008). Scholars continue to investigate educational strategies and practices to encourage cross-cultural dialogue, personal self-reflection, global understanding and citizenship. The study of moral education, conflict and peace education and education for global citizenship are burgeoning fields in comparative studies (Bickmore, 2008; Evans, 2008). International attention has now been drawn to the importance of peace building and the role of education in building a sustainable future (Smith Ellison, 2014; UNESCO, 2011). Scholars from the field of at-risk education remind us of the importance of highlighting the strengths and talents of children before identifying weaknesses and challenges (McCluskey, Treffinger, Baker & Wiebe, 2016). The educator's role should be to foster a nurturing environment that encourages, rather than discourages the child to feel a sense of belonging, acceptance and personal power (Wiebe, McCluskey, Baker, Van Bockern, Brendtro, Brokenleg, 2015). War and conflict disrupt this opportunity to create a safe and

nurturing environment to foster creativity, resilience, capacity building, and productivity.

During conflict, one of the most immediate concerns for organizations such as UNICEF is to establish schooling for displaced and war-affected children and youth. Yet, numerous barriers and obstacles complicate and disrupt the educational progress of children throughout the world. Initiatives to provide a sense of normalcy and to provide psychosocial support to children are perceived as ways to mitigate the harmful effects of violence against children. Having said this, Davies (2011) argues that there is a reluctance to see education as a priority in humanitarian or development aid, and investment in human capacity building is not recognized as having easily measureable returns that attract donors. For these aforementioned reasons, there seems to be a retraction in educational support from international and community-based organizations once there is relative stability. In conflict-affected countries, communities, schools and governments must rebuild programs and infrastructure. More importantly, as Udow, Anderson, and Magro (2013) note, individual and psychological support must be emphasized for transformative

learning to occur and for creativity and imagination to be released.

This research examines ongoing issues that affect the lives of youth who have been affected by war, conflict and violence in northern Uganda. While the purpose of our research was not to delve into the detailed experiences of each youth, we were more focused on how best to support their future educational and psychosocial development following conflict. More specifically, we set out to investigate how best to support teachers who work with youth affected by war and how to provide psychosocial and academic support within the classroom to better meet the needs and challenges of youth.

Our study uncovered numerous innovative approaches that supported the children's healing as well as creative activities that uncovered their remarkable resilience and unique gifts. Consistent with these goals, our inquiry was focused on the following three questions: (1) What are the major needs of war-affected children in northern Uganda? (2) What challenges does the educational community face in addressing these needs? (3) How might teachers more effectively respond to the psychosocial and educational needs of children who have been affected by war?

We concentrated our research program in two districts in northern Uganda, namely, Lira and Gulu. These northern regions were two of the areas most affected by war and the terror inflicted by Joseph Kony's and the Lord's Resistance Army. Lira and Gulu are two northern regions in Uganda close to the border of South Sudan. Lira is a Lango sub-region with a population just under 100,000. Gulu is located approximately 100 kilometres from Lira and is the largest city in northern Uganda with a population of just over 150,000 with a majority (80%) being of the Acholi sub-region.

Consistent with other post-conflict environments, education in northern Uganda has been disrupted, resources are limited, children are suffering from the effects of violence, torture, loss and instability, and teacher education is lacking at all levels (Ezati, Ssempala, and Ssenkusu, 2011). It is easy to take a deficit model approach when dealing with war-affected children, instead of recognizing them as a marginalized group in need of creative and innovative strategies to help connect them to school and to help uncover their unique skills, interests, and talents. War and violence undermine the foundation of education, and they destroy buildings and infrastructure (Sinclair, 2000).

Also, teacher preparation and development are often compromised. When conflicts have weakened the local educational administrative structures, priority is given to strengthen the capacity of the ministry and the regional and district levels of educational management (Sinclair, 2007) at the expense of providing sustainable teacher development and long term training to improve teacher capacity.

As a building block of human development, education serves as a foundation to progress in health, nutrition and development of institutions and democracy (Novelli, Mieke & Cardozo, 2008). Building the capacity of teachers is paramount to addressing the post-conflict needs of children and youth (Stewart, 2017). Moreover, preparing teachers with creative strategies to support conflict affected children is essential if we hope to develop the potential of each child. With the overarching goal of improving teacher capacity and knowledge to better meet the needs of children living in conflict-affected areas, this research was designed to provide the necessary data to develop inservice teacher development workshops and preservice teacher training courses.

Background

Uganda is a former British colony, and has endured constant unrest and violence from its independence in 1962 until 2008. The more recent conflict between the LRA and the government of Uganda differs from conventional situations of civil war. Without a coherent political agenda, the LRA is largely a movement organized around the Acholi leader Joseph Kony (Veale & Stavrou, 2007). Between 1986-2006, Kony rose to power by discrediting the government and by claiming inspiration from the Holy Spirit. He proclaimed that his army, and in particular, the children of northern Uganda, should kill the opposition and raise a new generation of Acholis who would repopulate the country. Throughout the 20-year period of civil war and the creation of Kony's LRA, it

is estimated that 1.5 million people have been displaced (Ezati et al., 2011). Over 30,000 children have also been abducted to become child soldiers, spies, and domestic workers or to be victims of sexual exploitation (UNICEF, 2008).

The Ministry of Education and Sports in Uganda (2008) reports that over a quarter of a million children over the age of 10 have lost one or both parents due to conflict and/or disease.

The civil war in Uganda has created a humanitarian disaster leaving over 400,000 people homeless and generations of children in crisis (Global Security, 2008). Since the peace talks in 2005, most of the northern Ugandans have left internally displaced camps to return to their communities. In November 2010, there were still 166,000 people in internally displaced persons (IDP) camps, but this figure has been greatly reduced since October 2008, when there were reported to be 915,000 IDPs (Internal Displacement Monitoring System, 2011).

While the majority of “returned children” have attempted to settle back into their communities, there are said to be in excess of 1200 children who are still held captive by the LRA serving as combatants, concubines or slaves (Blanc, 2011). With hope of rebuilding their lives after war and creating a culture of peace with this “lost generation” of youth, schools and district leaders face a tremendous challenge to meet the educational and psychosocial needs of these children. The reintegration of formerly abducted children has posed numerous challenges for teachers, parents, local organizations and government officials. After years in the bush, many children have great difficulty returning to a non-violent way of life and many are ostracized by their peers who remained in IDP camps during the war.

Education in conflict-affected areas

Discussions surrounding the role of education in post-conflict environments and the emergence of peacebuilding initiatives as a means to reconstruct and rebuild communities after conflict have become increasingly more prevalent in the comparative education literature (Barakat, Connolly, Hardman, Sundaram, 2013; Davies, 2004; Bush & Saltarelli, 2000; Paulson, 2011). Education can be a stabilizing force that helps to establish a sense of normalcy and routine (Mendenhall, 2014), yet education can also contribute to the escalation of conflict and the reinforcement of gender inequalities and marginalization (Davies, 2002).

The complexity of the relationship between conflict and education is difficult to articulate partly because it indirectly influences several structural causes of conflict that are difficult to disentangle (Brown, 2011). Socio-economic inequalities, political inclusion and exclusion, cultural influence and ethno-religious preferences, and potential sites for mobilization are four key factors that intersect other dimensions of conflict dynamics (Brown, 2011). Setting aside the conflicting discourse, the role of education in conflict-affected areas plays a critical role in reshaping the future and contributing to the creation of a more peaceful and stable society (World Bank, 2005). As Kirk (2007) asserts, if a lack of education leads to instability then it is imperative that we prioritize education in fragile contexts. Moreover, a more comprehensive understanding of how conflict has disrupted education and the effects it has had on children requires a more in depth understanding so that the most appropriate and relevant programs are provided to promote peace and stability.

Although the impact of conflict will vary between different contexts, Davies (2011) refers to the following factors influencing fragile contexts: a weak state; lack of legitimacy of government structures and/or public disengagement; conflict and inequality between and amongst groups; violence and despair; inequalities of wealth and extreme poverty; corruption; lack of accountability and trust; cultures of nepotism, natural disaster; poor technical skills; and a volatile or unpredictable population. Despite contextual differences, research affirms that there are tremendous challenges to support the educational and psychosocial needs of children living in conflict-affected areas (Betancourt Agnew-Blais, Gilman, Williams & Ellise, 2010; Cheney, 2005; Denov, 2010, Kirk, 2007). Conflict can have a devastating effect on both the infrastructure of communities and educational institutions (Bretherton, Weston, & Zbar, 2005). Moreover, exposure to conflict and

violence can influence the mental health and psychosocial well-being of students, staff and community members (Miller & Rasmussen, 2010; World Bank, 2005). Conflict disrupts families, destroys homes and schools, divides communities and shatters the foundation of children's lives and their trust in adults (Machel, 2001).

Ager et al. (2011) found that children in northern Uganda had been significantly affected by conflict. Reports indicate that 60% of schools in the conflict-affected region are not functioning and result in over 250,000 children not attending school (Ager et al., 2011). Displacement, trauma, loss and family separation has had a significant impact on learning and despite the relative stability in northern Uganda, teachers and students continue to be affected from their past experiences. Ezati, et al. (2011) report increased aggressiveness, lack of discipline, low academic ambition among learners, and low morale and motivation among teachers in northern Uganda. Furthermore, the experiences of conflict were said to “remain with teachers, children and young people, and affect their experiences, relationships and possibilities in the classroom” (Ezati, et al., 2001, p. 186).

The involvement of children and the forced abduction by the rebel Lord's Resistance Army exacerbates the complexity of the situation for children who are frequently and simultaneously referred to as both victims and perpetrators of violence (Cheney, 2005). As Maclure and Denov (2006) state:

[W]hen systems of governance function to serve the interests of a privileged few, and when family and community structures are weakened as a result of impoverishment and civil strife, children can be easily attracted or co-opted to join forces of social disruption and violence that ostensibly aim to transform the status quo” (p. 130).

Wessells (2005) notes that children are recruited as soldiers because they can easily be influenced and exploited, they are readily available, and they are considered expendable. Commanders manipulate and terrorize children who often have no other means of survival. In northern Uganda, the LRA was noted as consisting of 75% abducted children and youth who were subjected to isolation, physical beatings and intimidation to force them into obedience (Wessells, 2005). Veale and Stavrou (2007) found that although returnees from northern Uganda were accepted back into communities, many experienced isolation and disenfranchisement and were therefore vulnerable to rejection and re-recruitment. As a result of this, many of these children and youth have complications with participating fully in community activities and contributing to peacebuilding efforts.

Peace education is not without its challenges in situations of intractable conflict — program sustainability, legitimacy, applicability, impact, and the need to differentiate programs pose challenges for peace educators (Salomon, 2011). However, research suggests that even when faced with these barriers, peace education programs yield positive results (Rosen & Salomon, 2011). Many youth who have grown up through conflict and war possess an insatiable desire for social, political and economic justice (Stewart, 2011). Without a collaborative process for teaching and learning about peace education including children and the individuals that influence their development, issues such as structural violence, gender inequity, discrimination and racism will continue to perpetuate violence and conflict. For some youth, who have only lived in times of conflict, the promise of peace and stability is what motivates them to improve their lives, and it is what keeps them in school, off the street, and out of gangs and rebel groups.

Theoretical perspective

Bronfenbrenner (1999) conceptualizes the ecological environment “as a set of nested systems ranging from the ‘micro’ to the ‘macro’” (p. 11). Bronfenbrenner's model provided an organizational structure for the investigation, and insight into what systems need to be involved, and what interventions need to occur, in order to support war-affected children. While we considered the student's perspective to be of great importance, we were also intrigued to learn about the multiple spheres of influence that contribute to the education and development of the student. Moreover, we were particularly interested in the phenomenon of continuity and change in the people as both an

individuals and groups now that the conflict has ended. As Bronfenbrenner (2001) notes, the development of the individual is profoundly affected by events and conditions in the larger environment, and as such, we determined that the child who grows up in a community affected by conflict has either been directly affected by violence or displacement or indirectly affected by simply growing up in an environment where there was prolonged conflict and insecurity. We wanted to understand the needs of students as evidenced through the various individuals and systems interacting with the student for the purpose of finding practical strategies and theoretical models to help foster positive and healthy development following war and conflict.

Methodology

This qualitative study used semi-structured interviews, document analysis, and focus group interviews. The research program addressed the question: *How can educators more effectively respond to the psychosocial and educational needs of children who have been affected by war?* Our research activities included the following components: (1) collecting data on the effective strategies for educating war-affected children; (2) investigating the various systems and the programs that support children post-conflict; and, (3) developing teacher training curriculum to better prepare teachers to work with war-affected children.

The discussion for this paper will focus on the data concerning the effective strategies for educating war-affected children in Uganda. More specifically, we will discuss the findings from the data collection phase conducted in northern Uganda in November and December 2010 and two pilot studies also conducted in northern Uganda in 2008 and 2009. We identified seven key themes relating to the strategies for supporting children after war, and these themes will be discussed in relation to Bronfenbrenner’s Bioecological Model (2001) which we used to frame this research program.

As a brief explanation of these spheres of influence, the microsystem includes the closest connections an individual has with other people, such as parents, teachers, and friends. The mesosystem expresses the interrelations between these people and the individual, as in how parents and teachers relate to support a child. The exosystem includes spheres of influence that indirectly affect the child. These could include parents’ places of work, school district procedures, and governmental policies. The macrosystem relates to the cultural attitudes and norms of the individual’s social context. Finally, the chronosystem indicates changes to the individual over time.

Individual interviews and focus group interviews were conducted with 240 participants from northern Uganda, representing the five environmental systems, ranging from the individual’s school, the community, and the broader culture of society in which all other systems exist. A total of 104 participants were interviewed in Lira and 136 in Gulu.

Lira Participants

Students	70
Teachers	8
School Administrators	1
Counsellors	5
School Officials	1
Parents/Community Members	5
NGO	14
Total	104

Gulu Participants

Students	72
Teachers	5
School Administrators	7
Counsellors	8
School Officials	2
Parents/Community Members	20
NGO	22
Total	136

Using Bronfenbrenner’s Bioecological framework, 142 high school students were interviewed and their various ecological systems examined in an attempt to identify common trends and themes found in their various experiences. Students were interviewed in focus groups ranging from 4-15 participants per group. We asked students to identify what war-affected students needed to be successful and what was being done to help them adjust to life after war. In addition to this, we asked them, “In a perfect world, what would you do to best support the war-affected children in the schools or in the community?”

Specific schools in each district were identified as having a large number of students who were directly affected by war. Once we had the district supervisor's permission, we travelled to the respective schools to discuss our project with the headteacher. We asked him/her to help us identify both staff and students who might be willing to be interviewed. Prior to arriving in Gulu and Lira, we identified NGOs who worked specifically with children who were affected by war and we set up individual interviews with the directors or agency staff. We identified other potential organizations and people who worked with war-affected children and we travelled to meet them to set up interviews. In total, we conducted 240 interviews.

Three distinct activities based on the work by Taylor and Bogdan (1998) were incorporated into the phases of analysis: (1) the continual process of identifying themes and trends in the data; (2) the coding of data and the refinement of the subject matter; and, (3) the interpretation of the data in the context it was collected. Findings from two pilot studies (2008, 2009) and the November/December 2011 data collection phase revealed several effective strategies for assisting children who live in post-conflict situations. Each of these will be discussed in the following section and further analyzed in relation to Bronfenbrenner's Bioecological model.

Discussion of findings

Everyone is affected by war: The microsystem

The microsystem is the setting within which the individual is behaving at a given moment in his or her life. After decades of conflict and instability, it became apparent that many of the microsystems were fractured. Furthermore, the developmental processes that took place within these settings — whether it be in the home or classroom — were delimited by the macrosystem within which the microsystem was embedded. Participants frequently stated: “in northern Uganda, everyone is affected by war.” The people who make up the microsystem were experiencing their own psychological and financial burdens due to the years of conflict, and they were facing limitations due to lack of training, limited resources and the complexities of issues affecting children who may have no other means of support. Many teachers were trained during times of conflict, when resources were limited and training might not have been as rigorous or comprehensive. Teachers were coping with their own trauma, while at the same time, they had to support the emotional needs of children who were dealing with the effects of war. A headmaster explains this problem in the following excerpt:

What I have also observed is that some of these teachers actually their education background has not been very good because you know during the war. And I don't think the current teachers have undergone quality education that would actually make them very effective....But generally you can gauge the teacher's ability by the level of preparedness to teach and to work with the children and then you find the majority of teachers are having no progress record of the learners. Guidance and counselling would help them come out of their difficulties and be ready to work with children. I think that the best we can do at the moment because each of you get to interact with a teacher and all of a sudden you see the teacher is crying That means that something has affected him. Focusing on the teachers' needs would actually help them meet the needs of the learners.

Teachers indicated that they needed more training in helping children with psychosocial support, and they felt that their training in university or teaching colleges did not adequately prepare them to deal with the issues surfacing in their classrooms. Teachers frequently noted that they wanted more training in counselling because students often came to them with problems and they sought their advice on many issues. Students discussed the need for more teacher training so that teachers would be more understanding and supportive of their needs. Students indicated that if their emotional needs were not handled properly, they would experience more difficulties.

A student explains why more teacher training is needed:

Students begin developing feelings, if not handled in a positive way, can lead them into trouble further trouble. So they need that kind of support. They need access to resource persons and teachers who can share with them and guide them in discussions and get them into the habit of opening up for themselves so that they are confident.

Underscoring the need for basic necessities was the overarching need for children to be loved and nurtured by teachers. The following excerpt outlines the need for both financial and emotional support and the difficulties students experience with some teachers.

Interviewer: What kind of support do you think students need?

Student 1: At least scholastic material should be given to them, like books, pads, soap. But to me the most important one I think is love. They should be given love from teachers and other people who are close to them.

Interviewer: Do you think teachers give this love?

Student 1: No. Rarely. They don't. If it is there, it is very rare. It is minimal.

Interviewer: Why don't they give it?

Student 1: The population is so big. So they... you cannot know if this one is affected. If that person does not come and say they are disturbed...I am an orphan.... You cannot understand. So it is difficult for teachers to differentiate and give these people such kind of love.

Student 2: There is a problem of manhandling especially in this school. Teachers don't know how to handle students. Mostly when you are blamed. You have done something wrong. Someone just comes and drags you, pulling you....Oh my God, it is very shaming and alarming.

Student 3: And another problem for this class, we don't have some good teachers when they enter inside class. No greeting, just start paragraph. No introduce yourself, no smiling.

Students mentioned that in some schools students organized strikes or protested against harsh discipline or poor teaching. Students indicated that teachers often reported to school so that they would be paid, but they would not go to class to teach, and this angered the students. In some schools, students mobilized a "strike" that resulted in vandalism, violence and theft, usually targeted towards the teachers. In one school, teachers were tied up and rocks were thrown at them and the school buildings. With class sizes breaching over 60 students for one teacher, combined with little or no teaching resources, little government support, and poor remuneration for the work, teachers in northern Uganda are battling with poor morale and low confidence. Combining these factors with the reality of what it means to teach children who may have been abducted, tortured, or forced to kill and who do not have parents or guardians to support them at home, teaching was reported to be "frustrating," "demoralizing" and "depressing."

In addition to guidance and counselling training and support for the teachers' mental health, participants noted that teachers needed to be more personable with students and they needed to invest in forming relationships with students, instead of just delivering information. The use of corporal punishment was said to "cause fear and embarrassment" for students and it contributed to the lack of trust between the teacher and student and it frequently led to retaliation in the form of striking, vandalism, or fire setting. In one school a student was expelled but he returned in the night and set fire to the school building where the exams were being stored. An NGO suggests that teachers need to talk more to children and to stop using punishment to discipline children because it reminded them of what they had experienced in the bush. He states,

These children have experienced aggression where everything is done by force, infliction of pain, beating all the time. So if one commits a crime or does something bad, what we should not think about is using the stick because it reminds them about aggressiveness they have experienced before. The best is having a dialogue with them. Those who have returned, the focus should be on their health. We should focus and see how they are behaving, what they say, etc. because many of them are coming back with trauma, so we really need to focus on their health.

Despite the underlying challenges facing both students and teachers in the microsystem, the school system also provided numerous opportunities to support students through the provision of extracurricular and co-curricular activities. Sports, clubs and games were noted as being a source of support and a time to get together to have fun, to share experiences, and to gain a sense of accomplishment. Most schools offered both extra-curricular clubs and clubs during the school day. Some of the school-based clubs were the following: wildlife, crime prevention, debating, theatre, puppetry, knitting, basket-making, sports, human health, peace-building, conflict resolution and

livelihood (income generating projects). Students indicated that when there were no clubs to join, it made time for students to be “lazy” or to “think more about their experiences during the war” or to “remember the bush.” Competitive games were cited as being fun and offering both a therapeutic effect and helping students gain confidence. A teacher also notes that during games, he/she can see when a child is dealing with trauma. She says, “*doing games, competing and yes it is at such games that you can identify this child has trauma because the child may be very aggressive and any slight mistake you will see the child overreacting.*” Because many of the secondary schools were boarding schools, the clubs also helped to keep children active after school hours and provided a sense of belonging and a source of fun.

We can’t do this on our own: The mesosystem

The mesosystem is the set of microsystems and the interrelations among major settings that influence the student at a particular point in his or her life (Lerner, 2005). With many of the microsystems stretched to capacity and unable to provide essential services to support children, the infrastructure for collaboration and dialogue was limited. People in the microsystem and the settings within which the students interacted were in many cases the primary system or only system of support for the child. Many of the children were orphans and did not have parents, guardians or other family members. With the school being the primary source for providing this sense of belonging and acceptance, students indicated that because of the high needs, many students did not get the love they needed, either because of the teachers’ lack of training or because the needs in the system were so overwhelming. Complicating this matter was that students also felt that they were mistreated by some teachers, further contributing to the difficulties they experienced. A teacher notes,

Many of these children have lost parents during the war and as such many are orphaned children. They are trying to care for the young ones, and to do that some of them go and work. They get 500 shillings, they get 1000 shillings and that is not enough to maintain the family. You are asking the school to pay a bit of money but there is no way of getting it. And that time there were a lot of suicide cases, a lot of them...they needed some basic necessities where they cannot get them alone, they are not able to. And that kind of thing poses a lot of challenges for us.

References were made to the need for the school and the family to work together to support children. A parent indicates that schools cannot do all of the work to support children without the help of parents and the community working together. He states:

And then also the school administrators, including management committees and the PTA coming together to discuss a number of issues that would help to support these children to help them stay in school. The level of support of the parent and commitment is quite low. Teachers are trying, but they can’t make it complete without the parents. And we have a big number of children dropping out of school, especially the girls.

Historically, parental involvement in schools is fairly limited and considering that some of the schools were boarding schools, many parents had little interaction with the school.

While the various non-government organizations were providing several meritorious programs and services to students, we observed that many of these agencies were operating in isolation and sometimes duplicating services with little coordination between the systems. In some instances, the researchers noted that there seemed to be some competition or rivalry between the organizations, where workers would keep some of their programs private and not want to work collaboratively with other agencies. In instances where the school had a student who had a high level of trauma, there were particular NGOs who would work more closely with the school to support the child. Having said this, the exchange of knowledge in terms of what was being done to support the child was not always shared with the school. One of the counselling centres in Gulu was set up as a result of students returning from the bush and presenting serious psychological issues in the classroom. The counsellor from this centre states:

This is not holistic development. This means something should be done to help people with psychosocial. We need to concentrate on how we can help deal with the problems of abductions, the killings, the house burnings. If you combine psychosocial with development, for food, and water and security then this is holistic. We have not won the

battle because the war of trauma is still there. Counselling has to be a coordinated intervention because the war on trauma is just starting.

The counsellor's comments not only indicate the importance of coordinated services, but also the long-term necessity for psychosocial support that is integrated into all development programs. The counsellor further states:

We have had 20 years of war and 'development' vanished at once, when the war was done. No one cares about the post-war situation and honestly I can tell you the post-war situation is more dangerous than the actual combat situation. Households and families are fighting over land, child abuse issues are high and we have dependency issues.

The counsellor's comments are consistent with the literature noting the perception that education is considered emergency aid and not a form of development (Davies, 2011). As such, there is a paucity of educational capacity building and sustainable programs to support peace education.

In addition to the need for more interaction and coordination, some of the systems designed to support children are not trusted and the community will not access these systems for fear of retribution or because of the perception that the people working in these systems are corrupt. For example, an NGO worker states,

We get frustration from the police because they compromise about serious crimes like defilement or rape and end up bringing parties together and they send them back. Maybe the police is also corrupt. The perpetrators can come compromise with the police through bribes. That problem is everywhere, that is a frustration.

In addition to the challenges we noted between the organizations, participants also noted that families were enduring stress between members and therefore contributing to the dysfunction in the mesosystem. Compounding many of the issues in the school and community was family violence, drug and alcohol abuse and the lack of strong parental role models. A parent states,

The biggest problem is with parents. Most of them are not role models to the children. There is a lot of domestic violence. Children grow up thinking that the best way of solving problems is through violence or fighting. Communities need to be sensitized so that they stop domestic violence that may affect the children.

Participants indicated that community and parent capacity building was essential to combat the aforementioned issues. Participants indicated that peace workshops and parenting seminars would be beneficial as would home visits in the villages to talk to parents in their environments as a means to learn more about the issues they are experiencing. Several suggestions were made to work directly with the women in the community, as participants frequently mentioned that this would be more advantageous than calling the men together.

As a team of researchers we were never certain of the extent of suffering each person encountered and the effects war had taken on the family and community. While always being careful not to ask personal questions, we were constantly reminded that the effects of war and violence have taken an enormous toll on the individuals who now work tirelessly to rebuild both their own lives, the lives of their children, and the infrastructure in the community. Memories of loss, torture, violence and abduction continue to live on in the survivors and as many participants noted, this makes it challenging to offer help to support others who are also healing from similar experiences.

During an interview with a retired headteacher, he disclosed the pain and suffering he experienced because of the war and how it had an impact on his family. He made reference to feeling helpless in protecting both his own children and the children in his school. Our interview with him was solemn yet reflective as he recounted his decision to save his child by offering himself to the rebels.

I was in the war. I lived through all those times. I physically participated in those times...I was captured. It was very painful. I was the one, as the head teacher, they came to me. I was in the bush for three years, my children suffered. (tearing) That all. (pause)
So I know the needs... when I was away my children suffered. Until I came back. At night. I participated. And my foot is disfigured. They abducted my young girl, when she was cooking, she was taken to the bush. I wanted to die. If I had a gun ... But they said if you

want your child to go back, then you come and serve. I offered myself. And they released her. So, my life saved hers. Otherwise she would have been killed. I went instead of her. I suffered instead of her. And I came out after two years.

The words of the headmaster illustrate the tremendous burden left on this man because of the war and the loss of connection he felt to both his family and to the school community. As he recounted the story, he spoke of guilt and his feelings of failure in his role as an adult in the community because he could not stop the rebels from taking children. Within the mesosystem, we found fractured connections, yet we also observed that groups who were engaged in common or complementary tasks were working tirelessly to overcome personal difficulties from their own experiences for the collective purpose of helping the current generation of children. It is this collective goal or purpose that encouraged and united the system of microsystems.

They call us murderers: The exosystem

While not directly involving the developing student, the formal and informal structures also contribute to the delimitations and challenges imposed on students. The exosystem could be any social institution that ultimately affects the conditions of the student's life. Events occur in this system that affect the student and while the system may not have individuals that are significant to the child, these members can influence the child. The perception of the community greatly influenced and contributed to the self-worth of the students. Students and teachers discussed the negative perceptions of community members directed at the children who were abducted and have now returned from the bush. In particular, the schools that were exclusively for war-affected children, often noted the problems they had in the community. Many of the children would wear their school uniforms in the community and members would refer to them as "murderers," "rebels," and "killers." School administrators were working to develop more community acceptance, by talking to groups about how children were abducted and what happened to them in the bush. In one school, where there was excessive stigmatization in the community, students wrote and performed a play about their lives as abducted children. The play was presented at a community gathering and the headmaster felt that this increased the sensitivity to the children; he also believed that there was less name-calling after the play. A parent refers to the stigmatization in the following excerpt,

They should stop using bad language referring to them. Like some people call them killers. If you call them killers they will get traumatized. They might have killed because they were forced. So that stigmatization should stop so that they can live in peace.

Beyond community perceptions, policies affecting NGO funding and the overall support for teachers have a great effect on the development of the student. Moreover, the international community and contributions from donors might just be one of the most influential structures that can subvert or support the development of war-affected children. Much of the programming was dependent on non-government agencies, many of which were dependent on year-to-year funding grants that were ultimately funded by international donors and governments. That said, most of the programs and services were delivered to a small percentage of students. Teachers reported that morale was low, children were presenting with enormous challenges, and most teachers felt that they were not adequately prepared to meet the needs of their students. Many teachers commented that they were tired and they no longer felt the support of the community. One teacher states, "*We are a joke now, just a joke, like beggars, they shun us. The community does not respect us anymore.*" Teachers made an overwhelming call for more education, which included pedagogical training, more knowledge of psychosocial support and strategies to maintain personal wellness and stress management. The perception of the teachers was low and contributed to a low morale that had an effect both on how the teachers perceived their role in the school and how the community perceived teachers.

While youth strive to create a successful future for themselves, the overarching goal of getting an education remained at the forefront of their priorities. Despite much adversity and hardship, the youth remained focused on earning money to pay school fees, committed to long-term career goals and determined to achieve their dreams. Putting aside the ubiquitous need for financial support were strategies that would help rebuild this generation of children. Many adults commented on the crime they see in the community and the teachers frequently discussed behavioral issues in the school.

Implementing more of the programs that were said to help children and youth and working to build capacity within the family and community were thought to be the best ways to “save this generation of children.” Participants noted that during the war there were a number of organizations providing assistance, but now that there is relative peace, many international organizations have left and the country must now struggle to meet the long-term effects of war. A community counsellor says, “*What we are saying is we haven’t won the battle because the war of trauma is still here. Counselling has to be an intervention, because the war of trauma is just starting.*” A retired headmaster eloquently states:

It is like a fire burning. When the fire burns for five miles, there is still life behind. You think that all the creatures are dead. They are not dead. They were somewhere when the fire was coming. As the fire burns, there are organizations that will do the work so the beneficiaries—there is just too much for the organization. Which other organizations can come to help? So I advise other organizations who want to come and help to advise them to come to let them come. Come. To help people like us and to see who is left for you to help. There are a lot of interested people and children who you can help. We still need you. Let the people who want to help the children invest.

We need to bring back our culture: The macrosystem

The macrosystem is the superordinate level of the ecology of human development such as culture and public policy (Lerner, 2005). The culture in the society, the level of stability, the lifestyle and belief systems all shape the developing child. In Acholi culture, the “wang oo” was a communal space around a fire where elders told stories to the young. During times of conflict, the fires could not burn because rebels would find the homes and children could be abducted or killed. Children talked about how important the “wang oo” was to their culture and how the communal storytelling was beginning to occur again. We found that the rebuilding of culture was a prominent theme for helping individuals express themselves, to heal from the effects of instability and conflict, and to bring the community together again.

Storytelling was also a technique used to help children talk about a difficult experience. A counsellor notes,

“When you bring it in story form, the child is very attentive... You give it as a story, you may notice a problem with a child, sometimes you may not deal with the problem directly, you bring it in the story form of what could have happened to say an animal. The child listens and sees for himself or herself what or where the child has gone wrong and what the mother has been trying to say to correct the wrong deed.”

In this case, instead of discussing what the child directly experienced, the story was used as a conduit to personal expression. It appeared to be a safer way to express personal feelings or to recount a difficult experience. Participants frequently noted both the importance of music and dance to the Acholi and Lango culture and how music, dance and drama can be used to preserve culture and to support healing. Singing and dancing was said to “help students forget” or “take their mind off their suffering.” Others said it was an activity to do to keep busy and to provide self-confidence. Participating in school and local competitions was “friendly competition” that provided a source of pride and accomplishment. Songs and dances also had meaning or a moral that taught a lesson about being a good person. The following quote from a teacher highlights the importance of music and dance and the connections this has to the overarching culture and societal attitudes.

The different traditional dances, different traditional songs. And when they organize that of course, when you present then you involve the rest of the team, you know? From different areas of difficulty, you involve the rest of the team to participate. And normally all our different dances have their, their what? - their meanings attached, and there is something very particular that, you know, normally you gain out of sight, you know, such activities, even way back before, before this war. So it's a way of helping people come back to their normal routine, look at themselves still positively, and still discover something that they can be able to do.

Storytelling took many forms, from performance of drama or theatre scripts, to sharing family stories around a fire. The use of drawing or art making tended to be used more with primary level

children. When art was used with secondary level students, it tended to be sketching and sculpting out of wood. The process of doing art was often discussed as a way to listen to the students talking about their experiences. A teacher states, *“Through drawing, they have identified very many learners with trauma. When they [the students] were drawing they just let the draw go on and you will hear a lot.”* Teachers and counsellors noted that it was easy to see trauma in a child’s work. One counsellor states, *“From doing a piece of art you can identify that this child has trauma.”* A teacher also notes, *“In drawing alone, flashbacks may be there and then you see the child is just crying. You may ask the child, What is wrong with you? Then they start telling you, Madam, do you know what? When I was here, I saw my mother doing this, and that...So you let art talk.”* Art was used both as a process in which to talk and discuss common experiences, as well as a technique to express feelings, emotions or events when words were insufficient. Art was used as a way to bring back culture and to sustain traditional forms of expression, personal connections, and understanding.

Conclusion

This study helped to contribute to a greater understanding of the educational issues unique to youth from northern Uganda. At the time of the intensive conflict, most of the emergency relief work targeted teachers at the primary level because this was the age of most of the formerly abducted children. Because of this, there was a lack of resources for secondary students and a paucity of training offered to secondary level teachers. These children were now at the secondary level, and without adequate training, teachers were feeling at a loss to help many of the children who were presenting with serious social and emotional issues. Interviewed teachers often described their students as unmotivated, disrespectful, aggressive, angry, agitated, sad, afraid, and depressed. Many of the war-affected students were not enrolled in secondary schools because of disruptions to schooling, a lack of financial resources, and low academic preparation. In some cases, students were expelled from school because of behavioral issues and they were contributing to additional problems in the community.

Secondary teachers were struggling to deal with long-term psychosocial issues of students while at the same time coping with their own trauma and loss. Students felt that their teachers were too authoritative and did not understand their situations or needs. They often felt unsupported and fearful to talk to their teachers. At the same time, they expressed their gratitude to be in school and their desire to be educated. While peace education programs and strategies are needed to build the capacity of students in northern Uganda, the findings illustrate the overarching need to provide personal wellness and coping skills to help the teachers work through their own experiences of war. Approaches such as storytelling, music, dance and theatre were instrumental in not only helping children heal from war, but also act as a catalyst for uncovering the unique gifts and talents of each individual. War has deprived many children of the opportunity to develop their own gifts and talents, thus leaving them further marginalized and at-risk. With the appropriate tools, strategies, and teacher training, northern Uganda will be more prepared and hopefully feel more supported in their efforts to support and educate children.

Examining the findings using Bronfenbrenner’s (1999) model illustrates that the ecological systems that are intended to support the development of the child are in need of capacity building, healing and widespread coordination. At the basic level of the microsystem, many children lack supportive, intimate individuals, as they may be orphans or children with sick parents. Many also lack positive relationships with teachers. Lack of a supportive microsystem also creates an insufficient mesosystem as members simply do not have the resources or time to collaborate or exchange information. The exosystem is not supportive when there are insufficient financial policies and practices to support children through a positive educational environment. Cultural attitudes (towards former child soldiers, about gender, etc.) can negatively affect children’s opportunities. Finally, the length of time the children and communities have been under stress and trauma, for some their entire lives, contributes to the urgency of the problems and the overarching struggle to regain culture and the traditional way of life.

While there are pockets of programs that help children and youth, they are sporadic, limited in scope, and dependent on both funding and qualified staff to implement them. Participants in this study were quite clear about what was needed to support the educational and psychosocial needs of children in their country. The answers are there, but the resources are limited and infrastructure is fragile. Participants agreed that help from researchers, governments and the international community was essential for the necessary support to reach these children. War has left devastating effects on the people of northern Uganda. Everyone has been affected by war and a coordinated, multi-ecological systems approach to providing long-term assistance and support is needed.

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Ferguson, Florida, and Fruitvale: A Requiem for Black Males in the Key of F-Minor

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During my adolescent years, we referred to the elder statesmen and stateswomen in my church as our “seasoned saints.” I vividly remember the call and response rounds they would engage the church in when they sang one of my favorite gospel songs--the refrain *I don't want no trouble at the river, I don't want no trouble at the river, I don't want no trouble at the river when it's time for me to cross to the other side.*

We have made it to the river and we *have trouble* in our efforts to cross to the other side. What this commentary attempts to offer is a counter-narrative to consider as we attempt to divine solutions that will provide us safe passage to our destination of racial equality, solidarity, and uplift on “the other side.”

It was Josh Harkinson's article *4 Unarmed Black Men Have Been Killed By Police in the Last Month* that helped me to frame the Commentary that I was commissioned to complete for *Teachers College Record*. The stark reality in the author's portrayal of what was seemingly becoming an eerily dire trend in the country made me take pause and begin the deliberate process of trying to digest the news in small bites. Yet, despite my best efforts to swallow this jagged little pill, the acidity of racial reflux not only troubled my stomach but also disquieted my soul. Somehow, perhaps as a way to ease the pain of my own personal feelings about what I perceived to be an “open season” on Black men in the country, I at an organic level unwittingly started to shift my discourse about these men, and particularly when I was required to talk about them in public spaces I described them not by name, but by the locations where they met their untimely demise. Michael Brown, Trayvon Martin, and Oscar Grant III became coded as Ferguson, Florida, and Fruitvale--a congeries of locales that allowed me to reframe and rename these tragedies in a way that took away a bit of the sting coming from the lash of the whip that appeared to indiscriminately mete out punishments to my fellow brothers.

Notwithstanding my best efforts at psychological subterfuge, I had to face the harsh reality that it was not the place or space where these tragedies occurred that required my attention, but it was the cohort of individuals in these settings that required the focus of my gaze. I discussed the power of words, especially the use of labels in two separate articles I completed in 2006 that underscored the implications of the Hurricane Katrina tragedy on the African American residents in the city of New Orleans. I spoke to the use of the term “refugee” by those who reported on this incident and the residents who sought living accommodations and shelter in surrounding cities and states. The mainstream media was particularly culpable in their application of this moniker. My sense was that the use of this label made these American citizens appear to not only be nonresident but also foreign. It was something about the zeitgeist of that time related to the Katrina incident that appeared to set the stage for the subsequent framing of these Katrina survivors in a particular way. Perhaps the best explanation I can offer to explain how I viewed these occurrences is reflected in the theme I used in the article to categorize these events. I titled the section, *The Person Who Labels Has the Power*. In essence, because the media was able to set the stage, they named both the story and the people. While I did not fall prey to following the direction of the drum major in regard to the Katrina Tragedy, I did find myself sinking into the abyss of speaking about the shooting deaths of these young Black men in terms that were, from my perspective, media directed.

Beyond my personal sadness and struggle to comprehend the shooting deaths of Michael Brown, Oscar Grant III, Trayvon Martin, and Tamir Rice as well as the choking death of Eric Garner, I reflected on a number of issues that I perceived to be critical in framing the plight of young Black males in not only my professional field of education, but in society in general. What I have divined is that the experiences of Black males in P-20 schooling contexts, particularly as it overlaps with broader society is quite parallel. Perhaps the most fitting axiom to underscore my viewpoint is a statement that I share whenever I speak to audiences about my research on African American males in education settings; namely, “These men are not just Black and male when they come to school--they are Black and male all the time and that means something ‘in here’ and especially ‘out there’.” These reflections led me to the development of what I saw as four key themes that have meaning for how we attempt to understand the ways Black males interface with society in general and the education system in particular. Michael, Oscar, Trayvon, Tamir, and Eric were not murdered in schools; however, my argument is that Black males are killed in our nation’s classrooms on a routine basis. The four themes include: **Theme 1: *Speaking in Tongues: Black Masculinity and the Tower of Babel***; **Theme 2: *Referencing Rachmaninoff: A Threat to the Black Male Stereotype***; **Theme 3: *Talking about My Generation: Black Male Millennial Culture***; **Theme 4: *Meaning Making Beyond Morse: Code Switching and Survival Strategies***.

Theme 1: *Speaking in Tongues: Black Masculinity and the Tower of Babel*

This theme was developed to reflect the complexity and confusion that I have witnessed among agents within and external to educational settings who have attempted to explain and provide context for the expression of Black masculinity. All too often the first steps in this process of problematizing and subsequently offering solutions for understanding just how Black masculinity could be molded and shaped to fit the environment begins with separation of the constituent identity elements that make these individuals who they are. Thus, being a concomitant--Black/male becomes how we parcel Blackness and maleness to seek viable solutions that will address these identity vectors in isolation. In actuality a true understanding of these individuals is not found in silos that contain representative identity parts but in crucibles that allow for the mixture of these elements to come together that make the whole. In circles that often are drawn by academics’ conversations about intersectionality and what it means to be all of one’s identify at the same time as opposed to a set of unconnected dots awaiting the no.2 lead pencil to connect them. Hence, the talk about Black masculinity becomes at best fragmented and at worst distorted because the respective parties involved in the discourse are reflecting on constituent parts as opposed to the aggregated whole.

Theme 2: *Referencing Rachmaninoff: A Threat to the Black Male Stereotype*

Claude Steele masterfully unpacks the situational predicament known as *stereotype threat* in his book *Whistling Vivaldi*. What Steele problematizes in this work is the resultant impact of stereotype threat which is the belief held by individuals that they will confirm negative stereotypes about their social group. Steele provides vivid context for the book by chronicling the story of a young African American male who routinely walked down a particular street on his way to his intended destination. While the usual course of action for many of the White pedestrians he would attempt to pass on his journey would be to cross the street in order to avoid coming in close contact with him, on one of his walks he started to whistle a tune, and that tune was the music of the classical composer Antonio Vivaldi. What the young man noticed is that individuals who would have ordinarily crossed the street did not do so. The implication is that by whistling Vivaldi he seemed less menacing and less of a threat. After all, how could this man be all of those stereotypical things that are associated with Black men when he knew classical music? Thus, by whistling this tune he was able to in some ways disrupt the narrative about what it meant to be Black and male in the inner-city space.

As an African American male my own emic experiences corroborate what Steele highlights in his book. My selection of this theme is an adaption of Steele’s book title, but it is an authentic representation of experiences that I have had in my attempts to establish some sense of agency in White academia as well as in society writ large. As an undergraduate I majored in chemistry and for several years maintained a minor in music (piano performance). I find that these two biographical factoids have provided me fuel and subsequently mileage on the long and circuitous journey through

mainstream American culture. I surreptitiously infuse into conversations in which I know that my intellectual acumen is being adjudged. One of my favorite composers I used to satisfy my musical appetite when I was steeped in music theory courses and piano lessons during my undergraduate days was Rachmaninoff. I would sometimes lock myself away in one of the “piano rooms” there on the University of North Texas campus and play to hearts content or at least until I could ease my level of stress from trying to balance a very demanding course schedule. So, dropped right into conversations at the time when the cultural capital vetting process seems to be at its most heightened state, I mention my K-12 experiences advancing to state level competition in piano during both my junior and senior years in high school. Just as the Black male in Steele’s book took notice of the warming of the chill that was in the air, I too found that I could slip out of my coat for just a few moments.

Theme 3: *Talking about My Generation: Black Male Millennial Culture*

In 2011 I co-edited a book with my colleagues titled *Diverse Millennial Students in College: Implications for Faculty and Student Affairs*. What this volume attempted to accomplish was to shed light on the millennial cohort of college students that were occupying postsecondary institutions. The book highlighted millennial culture with a fine-grained focus on millennials from diverse ethnic and racial enclaves. The authors each provided data and information that would assist faculty and student affairs practitioners to better understand this generational cohort. Readily apparent in the book is that millennials of color in some ways paralleled their majority peers in related to their interests and motivations, but just as many commonalities were discovered as was an almost equal list of dissimilarities. Thus, for Black male populations in higher education the challenge for institutions is to understand who they are not only from ethnic, gender, and racial perspectives but to also consider where they are coming from based on their generational affiliations.

Theme 4: *Meaning Making Beyond Morse: Code Switching and Other Survival Strategies*

A sociolinguistic term that has been consistently threaded across my scholarly and research engagements has been the concept code switching. Recognizing the importance of altering behavior (code) is essential for Black male survival. In Theme 3 above, I along with the Black male mentioned in Steele’s book engaged in a process of code switching by altering our behavior or conversational patterns to fit the contexts in which we were situated. A lack of understanding of when and where to switch codes for Black males can prove to be deadly. Some Black males have expressed that shifting away from their preconceived notions of what Black maleness looks like and how it should be performed leaves many of these men expressing angst about what they perceive to be an inauthentic representation of who they really are. Thus, statements like, “I keep it 100” is their attempt at expressing the need to be authentic.

So, as we gather in an encampment at the banks of the river, it will be essential for us to find ways to “sing off the same song sheet” and perhaps we will then find ways to harmonize joyful songs of celebration and triumph as opposed to blending foreboding melodies of sadness and defeat.

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Reexamining the Role of Gifted Education and Talent Development for the 21st Century: A Four-Part Theoretical Approach

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Abstract

Why and how should a society devote special resources to the development of giftedness in young people for the twenty-first century? If we agree that the goals of gifted education and talent development are to maximize young people's opportunities for self-fulfillment and increase society's reservoir of creative problem solvers and producers of knowledge, then it would seem wise that programming and services enhance students' capacity for creative productivity, not just content acquisition. This general theory for the development of human potential is discussed through an exploration of four research-based subtheories: the Three-Ring Conception of Giftedness, the Enrichment Triad Model, Operation Houndstooth, and Executive Functions. In this article, a reexamination of current gifted and talented programming is intended to generate future research, extend dialogue among scholars, and inspire continued support for programming based on theory and related research.

Keywords: Gifted education; Enrichment Triad Model; Operation Houndstooth; talent development; Three Ring Conception of Giftedness.

He who loves practice without theory is like the sailor who boards a ship without a rudder and compass, and never knows where he may land. Leonardo da Vinci

The field of gifted education is based on the almost universally accepted reality that some learners demonstrate out-standing performance or potential for superior performance in academic, creative, leadership, or artistic domains when compared with their peers. From preschool through college and even at graduate and professional school levels, a range of learning potentials justifies an examination of differentiated opportunities and services. As the quotation above points out, if we are not guided by a unified theory when choosing options we are likely to fall for anything! Theory is, indeed, the rudder and compass that should guide us toward practices that avoid randomness in the goals we pursue.

Absence of theory in educational practice usually results in services comprising fragmented, and loosely related activities rather than integrated theory-driven programs characterized by internal consistency from goal setting to services and evaluation. Without sound underlying theory—and the will to stick to the charted course—what happens in classrooms is often a reaction to political or commercial interests or the whims of bureaucratic policy makers far removed from classrooms; or it can be based on questionable research and scholarship or the latest fads or flavor-of-the-month “innovation” devised by gurus without credential, or well-intentioned but unapprised local sages; or a combination of the above. However, theory alone will not make substantial differences unless it has generated a strong research base, is translated into logically derivative practices that are relatively easy for practitioners to understand and implement, and has the flexibility for those practices to be adapted to variations in local demographics and resources (Ambrose, Cohen, & Tannenbaum, 2003; Ambrose, VanTassel-Baska, Coleman, & Cross, 2010; Cohen, 1988; Renzulli, 2011).

Effective theories for educating gifted and talented students require two additional and related characteristics. First, the theory should exhibit a logical relationship between the theory-guided

services provided to students and the conception of giftedness that serves as a rationale for the development of that theory. An acceleration-based theory that recommends the use of advanced mathematics courses, for example, should obviously be related to a conception of gifted that targets students with high aptitudes in math. Second, and particularly relevant to the enrichment-based theory presented in this article, services should be provided for both advanced cognitive development and what are referred to below to as “intelligences outside the normal curve.” A rationale for this requirement and an accompanying conception of giftedness has evolved over the past three decades as a guide for the implementation of school programs designed to develop giftedness and talents in young people.

The overall theory is composed of four interrelated sub-theories and is based on the belief that when one is reexamining the role of theory in gifted education one should always begin with the why question — Why should a society devote special resources to the development of giftedness in young people? Although there are two generally accepted purposes for providing special education for young people with high potential, these two purposes in combination give rise to a third purpose that is intimately related to the conception of giftedness question.

The first purpose of gifted education is to provide young people with maximum opportunities for self-fulfillment through the development and expression of one or a combination of performance areas where superior potential may be present. The second purpose is to increase society’s reservoir of persons who will help solve the problems of contemporary civilization by becoming producers of knowledge and art rather than mere consumers of existing information. Although there may be some arguments for and against both of the above purposes, most people would agree that goals related to self-fulfillment and/or societal contributions are generally consistent with democratic philosophies of education.

What is even more important is that the two goals are highly interactive and mutually supportive of each other. In other words, self-satisfying work of scientists, artists, writers, entrepreneurs, and leaders in all walks of life has the potential to produce results that are valuable contributions to society. If, as I have argued, the purpose of gifted programs is to increase the size of society’s supply of potentially creative and productive adults, then the argument for special education programs that focus on creative productivity (rather than lesson-learning giftedness) is a very simple one.

If we agree with these two goals of gifted education, and if we believe that our programs should produce the next generation of leaders, problem solvers, and persons who will make important contributions to all areas of human productivity, then the third purpose of gifted education is to show the sensibility in modeling special programs and services after the *modus operandi* of these persons rather than after those of good lesson learners. This view is not an argument against good lesson learning and high levels of achievement and text consumption. But good lesson learning should be the province of the best-quality general education that schooling can provide to all students according to their individual needs and aptitudes.

A focus on creative productivity, however, is especially important because the most efficient lesson learners are not necessarily those persons who go on to make important contributions to knowledge. And in this day and age of exponential knowledge expansion, it would seem wise to consider a model that focuses on how our most able students access and make use of information rather than merely on how they accumulate, store, and retrieve it.

This general theory draws on the work of several researchers and scholars, and like any other theory, it is intended to synthesize accumulated knowledge and hopefully motivate further research. And, of course, the final outcome for theory in an applied field is not only an effective practice for targeted audiences, which in our field are mainly teachers and students, but also include administrators and policy makers.

A few words about terminology

In both education and psychology the term *giftedness* has evolved into a theoretical construct (something to be studied). Although most writers use the word *gifted* as a noun, I have consistently used the term *gifted* as an adjective (e.g., gifted behaviors, a gifted writer) rather than a noun (e.g., referring to an individual or group as “the gifted”). And when I refer to gifted education or gifted programs, the adjective is in the context of the root meaning of the word — that which is given. Thus, I have consistently argued (e.g., Renzulli 1998, 2005) that we should label the services necessary to develop high potentials rather than labeling the students as gifted or not gifted. Accordingly, when we identify traits or aptitudes in students, we should focus on specific behavioral manifestations (e.g., superior memory for important dates in history, ability to generate creative ideas, high task commitment in film making, advanced analytic abilities in mathematics).

I have also purposely made a distinction between two types of giftedness. The first is called high achieving or schoolhouse giftedness, referring to students who are good lesson learners in traditional school achievement. The second is creative productive giftedness, referring to the traits that inventors, designers, authors, artists, and others *apply* to selected areas of economic, cultural, and social capital. These two types of giftedness are not mutually exclusive, but the distinction is important because of the implications for the ways in which we develop gifted behaviors in educational settings. The four parts of my work that contribute to the overall theory are depicted in Figure 1.



Figure 1: A four-part theory of talent development.

These subtheories, taken collectively, are designed to point out both the ways in which we can identify talent potential in young people, how we can develop both academic talent, and what I refer to as “intelligences outside the normal curve.” These nonintellectual traits are as important in promoting the development of fully functioning high potential individuals as are traditionally measured cognitive traits. Furthermore, the theories are based on several years of research that has been summarized by Gubbins (1995), Renzulli and Reis (1994), Reis and Renzulli (2003), and Reis et al. (2005). Also included in the development of the theories is the work of others who have conducted research related to the underlying concepts and constructs that make up the theory (Duckworth, 2009; Duckworth & Quinn, 2009; Sytsma, 2003).

Finally, the relationship between the gifted field and general education is reflected by these theories. Currently, education policy and practice focus on “21st Century Skills” (e.g., Bellanca & Brandt, 2010; Partnership for 21st Century Skills, 2011; Trilling & Fadel, 2009). Notably, these skills reflect an area that has been the centerpiece of gifted education for many years. What is most interesting about the popularization of 21st Century Skills is that attention is now being given to noncognitive as well as strictly cognitive skills. Significant contributions in this area of research include Gardner’s Good Works project, which focuses on excellence, ethics, and engagement and documents the conclusion that many young people want to work to make the world a better place (Fischman & Gardner, 2009); Sternberg’s work on wisdom, which targets achieving a common good through a balance among intrapersonal, interpersonal, and extrapersonal interests (Sternberg, 1998); and Seligman’s work on positive psychology, which deals with the development of character strengths and virtues (Seligman, 1998).

Hopefully, this summary and articulation of the conceptual foundations being presented will generate more research, extend dialogue among scholars in the field, and perhaps even impel more scholars to devote attention to a field that has been limited in theoretical underpinnings (Ambrose et al., 2010).

The Four-Part Theory

For over four decades I have been examining and reexamining the meaning of the age-old questions of “What makes giftedness?” and “How do we develop it in young people?” I raised the first part of this question in an article that reexamined existing conceptions of giftedness (Renzulli, 1978) and emerging research led to updates (Renzulli, 1986, 2005). I have continued to explore what causes some people to use their intellectual, motivational, and creative assets in ways that lead to outstanding manifestations of achievement and creative productivity, whereas others with similar or perhaps even greater potential fail to achieve high levels of accomplishment. I continue to wonder what causes the development of only a minuscule number of Thomas Edisons or Rachel Carsons or Langston Hughes or Isadora Duncans, whereas millions of persons with equal “equipment” and educational advantages (or disadvantages) never rise above mediocrity. Why do some people who have not enjoyed the advantages of special educational opportunities achieve high levels of accomplishment, whereas others who have benefitted from the best of educational opportunities and enriching lifestyles fade into obscurity (Dai & Renzulli, 2008; Renzulli, 1982; Sternberg, 2003)?

Other questions have also led to attempts to frame the nature of giftedness. Is giftedness an absolute concept or a relative concept? That is, is a person either gifted or not gifted (the absolute view) or can varying kinds and degrees of gifted behaviors be displayed in certain people, at certain times, and under certain circumstances (the relative view)? Is gifted a static concept (i.e., you have it or you do not have it) or is it a dynamic concept (i.e., it varies both within persons and within learning-performance situations; Renzulli, 1986)?

This article represents a synthesis of the literature that frames my responses to the questions above in combination with the purposes of gifted education that form the rationale for recommended approaches to developing giftedness. Although I refer to this work as a general theory for the development of human potential, it is made up of four subtheories I have worked on over the years and that are presented in graphic form in Figure 1.

Subtheory I: The Three-Ring Conception of Giftedness

The Three-Ring Conception of Giftedness attempts to portray the main dimensions of human potential for creative productivity. The name derives from the conceptual framework of the theory—namely, three interacting clusters of traits (Above Average Ability, Task Commitment, and Creativity) and their relationship with general

and specific areas of human performance. Perhaps the most salient aspect of this theory is that it is the interaction among these clusters of traits brought to bear on a particular problem situation that creates the conditions for the creative productive process to commence.

A second aspect of the theory posits that

whereas abilities (especially general intelligence, specific aptitudes, and academic achievement) tend to remain relatively constant over time, creativity and task commitment are contextual, situational, and temporal. Finally, these clusters of traits emerge in certain people, at certain times, and under certain circumstances. The Enrichment Triad Model is the compatible learning theory from which I attempt to prescribe educational conditions that create the conditions for stimulating interaction between and among the three rings, described below.

Above Average Ability encompasses both general (e.g., verbal and numerical reasoning, spatial relations, memory) and specific (e.g., chemistry, ballet, musical composition, experimental design) performance areas and is the most constant of the rings. That is, any student's performance within the parameters of this ring is minimally variable, as it is linked most closely with traditional cognitive/intellectual traits. The reason that this ring makes reference to "above average ability" (as opposed to, e.g., "the top 5%" or "exceptional ability") derives from research that highlights minimal criterion validity between academic aptitude and professional accomplishments (Renzulli, 1976, 1986, 2005). In other words, research suggests that, beyond a certain level of cognitive ability, real-world achievement is less dependent on ever-increasing performance on skills assessment than on other personal and dispositional factors (e.g., task commitment and creativity). This

realization highlights the limitations of intelligence tests and the innumerable aptitude and achievement tests that are used to identify candidates for "gifted programs."

Task Commitment represents a nonintellective cluster of traits found consistently in creative productive individuals (e.g., perseverance, determination, will power, positive energy). It is best summarized as a focused or refined form of motivation—energy brought to bear on a particular problem or specific performance area. The significance of this cluster of traits in any definition of giftedness derives from myriad research studies as well as autobiographical sketches of creative productive individuals. Simply stated, one of the primary ingredients for success among persons who have made important contributions to their respective performance areas is their ability to immerse themselves fully in a problem or area for an extended period of time and to persevere even in the face of obstacles that would inhibit others.

Creativity is that cluster of traits that encompasses curiosity, originality, ingenuity, and a willingness to challenge convention and tradition. For example, there have been many gifted scientists throughout history, but the scientists whose work we revere, whose names have remained recognizable in scholarly communities and among the general public, are those scientists who used their creativity to envision, analyze, and ultimately help resolve scientific questions in new, original ways.

In summary, the Three-Ring Conception of Giftedness is based on an overlap and interaction between and among the three clusters of traits that create the conditions for making giftedness. Giftedness is not viewed as an absolute or fixed state of being (i.e., you have it or you do not have it). Rather, it is viewed as a developmental set of behaviors that can be applied to problem-solving situations. Varying kinds and degrees of gifted behaviors can be developed and displayed in certain people, at certain times, and under certain circumstances. The rationale for the Three-Ring Conception of Giftedness draws on the previously mentioned anticipated social roles of persons with high potential.

Subtheory II: The Enrichment Triad Model

All learning exists on a continuum ranging from deductive, didactic, and prescriptive approaches at one end to inductive, investigative, and constructivist-based approaches at the other. This continuum exists for learners of all ages— from toddlers to doctoral students—and it exists in all areas of curricular activity. The continuum also exists for learning that takes place in the nonschool world, the kind of experiences that young people and adults pursue as they acquire new skills for their jobs or work in the kitchen, the garden, or the workshop in the basement. (There are, of course, occasions when a particular approach falls between the two ends of the continuum, but for purposes of clarifying the main features of deductive and inductive learning, I will treat the two models as polar opposites.) Both models of learning and teaching are valuable in the overall process of

schooling, and a well-balanced school program must make use of both approaches as well as strategies that use a combination of these approaches.

The deductive model of learning. Although many names have been used to describe the theories that define the ends of the learning continuum, I simply refer to them as the Deductive Model and the Inductive Model (Guilford, 1967). The Deductive Model is familiar to most educators and guides; it represents much of the learning that takes place in class-rooms and other places in which formal learning is pursued. The Inductive Model, on the other hand, represents the kind of learning that typically takes place outside formal school situations. A good way to understand the difference between these two types of learning is to compare how learning takes place in a typical classroom with how someone learns new material or skills in real-world situations. Classrooms are characterized by relatively fixed time schedules; segmented subjects or topics; predetermined sets of information and activities, tests, and grades to determine progress; and a pattern of organization that is largely driven by the need to acquire and assimilate information and skills that are deemed important by curriculum developers, textbook publishers, and committees who prepare lists of standards. The deductive model assumes that current learning will have transfer value for some future problem, course, occupational pursuit, or life activity.

Deductive learning is based mainly on the factory model or human engineering conception of schooling. The underlying psychological theory is behaviorism, and the theorists most frequently associated with this model are Ivan Pavlov, E. L. Thorndike, and B. F. Skinner. At the center of this ideology is the ability to produce desirable responses by presenting selected stimuli. In educational settings, these theories translate into a form of structured training for purposes of knowledge and skill acquisition. A curriculum based on the Deductive Model must be examined in terms of both what and how something is taught.

The instructional effects of the Deductive Model are those directly achieved by leading the learner in prescribed directions. There is nothing inherently “wrong” with the Deductive Model; however, it is based on a limited conception of the role of the learner and fails to consider variations in interests and learning styles. Also, in this approach, students are always cast in the roles of lesson-learners and exercise-doers rather than authentic, first-hand inquirers.

The inductive model of learning. The Inductive Model, on the other hand, represents the kinds of learning that ordinarily occur outside formal classrooms in places such as research laboratories, artists’ studios, theaters, film and video production sets, business offices, service agencies, and within almost any extracurricular activity in which products, performances, or services are pursued. The theorists most closely associated with inductive learning are John Dewey, Maria Montessori, and Jerome Bruner. The type of learning advocated by these theorists can be summarized as knowledge and skill acquisition gained from investigative and creative activities that are characterized by three requirements (Renzulli, 1977, 1982a). First, there is a personalization of the topic or problem—students are doing the work because they want to. Second, students are using methods of investigation or creative production that approximate the modus operandi of the practicing professional, even if the methodology is at a more junior level than that used by adult researchers, film makers, or business entrepreneurs. Third, the work is always geared toward the production of a product or service intended to have an impact on a particular audience.

The information (content) and the skills (process) derived in inductive learning situations are based on need-to-know and need-to-do requirements. For example, if a group of students is interested in examining differences in attitudes toward dress codes or teenage dating between and within various groups (e.g., gender, grade, students vs. adults), they need certain background information. What have other studies on these topics revealed? Are there any national trends? Have other countries examined dress code or teenage dating issues? Where can these studies be found? Students will need to learn how to design authentic questionnaires, rating scales, and interview schedules and how to record, analyze, and report their findings in the most appropriate format (e.g., written, statistical, graphic, oral, dramatized). Finally, they will need to know how to identify potentially interested audiences, the

most appropriate presentation formats (based on a particular audience's level of comprehension), and how to open doors for publication and presentation opportunities. Information used in inductive learning is based on just-in-time (JIT) knowledge as opposed to the to-be-presented knowledge that characterizes most deductive learning situations. The Internet has made JIT knowledge easily available to today's learners; and the interactive capacity of today's technology allows students to go beyond simple text consumption and worksheets-on-line.

This example demonstrates how knowledge and skills become instantaneously relevant because they are necessary to prepare a high-quality product. All resources, information, schedules, and sequences of events are directed toward this goal, and evaluation (rather than grading) is a function of the quality of the product or service as viewed through the eyes of a client, consumer, or other type of audience member. Everything that results in learning in a research laboratory, for example, is for contemporaneous use. Therefore, looking up new information, conducting an experiment, analyzing results, or preparing a report or presentation is an action-oriented and investigative act of learning. We can see here the relevance of the JIT knowledge mentioned above. This kind of learning differs from deductive learning, and the skills developed in investigative learning are the better outcome for preparing young people for creative and productive futures.

In summary, the Deductive Model has dominated the ways in which most formal education is pursued, and the track record of the model has been less than impressive. One need only reflect for a moment on his or her own school experience to realize that with the exception of some basic language and mathematics skills, much of the compartmentalized material learned for some remote and ambiguous future situation is seldom used in the conduct of daily activities. The names of famous generals, geometric formulas, the periodic table, and parts of a plant learned outside an applicable, real-world situation are generally quickly forgotten. This is not to say that previously learned information is unimportant, but its relevancy, meaningfulness, and endurance for future use is minimized when learned apart from situations that have personalized meaning for the learner.

The enrichment triad model. The three types of enrichment in the Triad Model (see the upper right hand corner of Figure 1) are designed to work in harmony with one another and it is the *interaction* among the types of enrichment that produces the dynamic properties represented by the arrows that are as important as the individual components in achieving the goals of this inductive approach to learning. Type I Enrichment includes general, exploratory activities that expose students to problems, issues, ideas, notions, theories, skills—in sum, *possibilities*. Often, this type of enrichment serves as a catalyst for curiosity and internal motivation. Type I enrichment may be the method for externally stimulating students toward internal commitment and purpose. These activities should be made available to all students. A highlight of the model that under-scores the philosophy behind the Three-Ring Conception of giftedness is that task commitment and creativity are crucial to the development of potentially gifted students, who may “rise to the challenge” in unexpected ways or at unexpected times, given the proper environment.

Type II Enrichment involves both individual and group training in a variety of cognitive, meta-cognitive, methodological, and affective skills. This type of enrichment prepares the students to produce tangible products and/or generate resolutions to real-world problems through its emphasis on skill development and information gathering. It is not enough to be curious and moved toward action; one must also be equipped to tap and use resources in order to take action. Type I activities are intended to capture students' interests—to inspire— whereas Type II activities are intended to teach students how to move from inspiration to action. Type II activities are contingent on the students' developmental levels and, as such, should vary in complexity and sophistication with personal and academic maturity. Generally, there are five categories of Type II activities, all of which may be considered as focusing on process skills: (a) cognitive training, (b) affective training, (c) learning-how-to-learn training, (d) research and reference procedures, and (e) written, oral, and visual communication procedures. Type II Enrichment activities can also serve as points of entry into Type III involvement.

Type III activities are individual and small group investigations of real-world problems. Real-world problems are here defined as problems that evoke a personal frame of reference for students, problems with no existing or unique resolution, and problems designed to have an impact on a targeted audience. As with Type II activities, the sophistication and depth of Type III activities is contingent on students' developmental levels. Regardless of the level of influence and breadth of reach of solutions to real-world problems generated by Type III activities, all such activities encompass four objectives for students: (a) to acquire advanced-level understanding of the knowledge and methodology used within particular disciplines, artistic areas of expression, and interdisciplinary studies; (b) to develop authentic products or services that are primarily directed toward bringing about a desired impact on one or more specified audiences; (c) to develop self-directed learning skills in the areas of planning, problem finding and focusing, management, cooperativeness, decision making, and self-evaluation; and (d) to develop task commitment, self-confidence, feelings of creative accomplishment, and the ability to interact effectively with other students and adults who share common goals and interests.

Type III experiences are the culmination of natural learning, representing synthesis and an application of content, process, and personal involvement through self-motivated work. These activities serve as the vehicles within the total school experience through which everything from basic skills to advanced content and processes “come together” in the form of student-developed products and services. They may be referred to “the assembly plant of the mind.” Clearly, the student's role is transformed from one of lesson-learner to first-hand investigator or creator, and the teacher's role must shift from that of instructor or disseminator of knowledge to some combination of coach, promoter, manager, mentor, agent, guide, and sometimes even colleague.

Subtheory III: Operation Houndstooth — Gifted Education and Social Capital

The rationale for this subtheory and the one that follows is based on the anticipated roles that individuals with high potential play in society. Whether we like it or not, history has shown us that highly able people assume important positions in all walks of life—government, law, science, religion, politics, business, and the arts and humanities. What kinds of leaders will these people be? What kinds of life experiences created the contrasting behaviors of Nelson Mandela and Idi Amin? This subpart of the overall theory addresses the question: “Why do some people mobilize their interpersonal, political, ethical, and moral realms of being in such ways that they place human concerns and the common good above materialism, ego enhancement, and self-indulgence?” The abundance of folk wisdom, research literature and biographical and anecdotal accounts about creativity and giftedness are nothing short of mind boggling; and yet we are still unable to answer this fundamental question about persons who have devoted their lives to improving the human condition. Several theorists have speculated about the necessary ingredients for giftedness and creative productivity, and their related theories have called attention to important components and conditions for high-level accomplishment.

However, most of these theories have dwelt only on cognitive characteristics, and by so doing, they have failed to explain how the confluence of desirable traits result in commitments for making the lives of all people more rewarding, environmentally safe, economically viable, peaceful, and politically free. Work related to this topic examines the scientific research that defines several categories of personal characteristics associated with an individual's commitment to the production of social capital, briefly defined here as using one's talents to improve human conditions, whether that improvement is directed toward one person or larger audiences or conditions. These characteristics include optimism, courage, romance with a topic or discipline, physical and mental energy, vision and a sense of destiny, and sense of power to change things (Renzulli, 2002).

These factors and their subcomponents are portrayed in the lower right quadrant of Figure 1. They are represented in the Three-Ring Conception figure by the houndstooth background in which the three clusters of traits are found. I call these “Houndstooth” traits co-cognitive factors because they interact with and enhance the cognitive traits that are ordinarily associated with the development

of human abilities. A number of researchers have suggested that constructs of this type, including social, emotional, and inter-or intrapersonal intelligence, are related to each other and are independent from traditional measures of ability. The two-directional arrows in this diagram point out the many interactions that take place between and among the factors.

The general goal of this work and a related intervention model is designed to infuse into the overall process of schooling experiences that promote the Houndstooth components and that ultimately give highly able young people a sense of their responsibility to society at large. It would be naïve to think that a redirection of educational goals can take place without a commitment at all levels to examine the purposes of education in a democracy. It is also naïve to think that experiences directed toward the production of social capital can, or are even intended to, replace our present-day focus on material productivity and intellectual capital. Rather, this work seeks to enhance the development of wisdom and a satisfying lifestyle that are paralleled by concerns for diversity, balance, harmony, and proportion in all the choices and decisions that young people make in the process of maturing. What people think and decide to do drives some of society's best ideas and achievements. If we want leaders who will promote ideas and achievements that take into consideration the components we have identified in Operation Houndstooth, then giftedness in the new century will have to be redefined in ways that take these co-cognitive components into account. And the strategies that are used to develop giftedness in young people will need to give as much attention to the co-cognitive conditions of development as we presently give to cognitive development.

Subtheory IV: Executive Functions — Leadership for a Changing World

The fourth and final theory may very well be the “yeast” that enables all constructs described above to actually be used to pursue a desired goal in an efficient and effective way. I sometimes describe this final subtheory as simply “getting your act together.” The most creative ideas, advanced analytic skills, and the noblest of motives may not result in positive action unless leadership skills such as organization, sequencing, and sound judgment are brought to bear on problem situations. Landmark research by Duckworth, Seligman, and others (Borghans, Duckworth, Heckman, & Weel, 2008; Duckworth, 2009; Duckworth, Peterson, Matthews, & Kelly, 2007; Duckworth & Quinn, 2009; Duckworth & Seligman, 2005) has shown that students who persist in college were not necessarily the ones who excelled on measures of aptitude, but the ones with exceptional character strengths such as optimism, persistence, and social intelligence. This research showed that measures of self-control can be more reliable predictors of students' grade-point averages than their IQ scores. Including this focus in the overall theory represents a distinctly different approach to talent development than most of the models focusing primarily on cognitive development. The research noted above documents that both IQ and self-discipline are correlated with grade-point average, but self-discipline is a much more important contributor: Those with low self-discipline have substantially lower college grades than those with low IQs, whereas high-discipline students received much better grades than high-IQ students. Even after adjusting for the student's grades during the first marking period of the year, students with higher self-discipline still had higher grades at the end of the year. The same could not be said for IQ. Furthermore, these studies found no correlation between IQ and self-discipline—these two traits varied independently.

I have focused my work in this area on what are commonly referred to in the business and human resource literature as executive functions. Executive functions are broadly defined as the ability to engage in *novel* situations that require planning, decision making, troubleshooting, and compassionate and ethical leadership that is not dependent on routine or well-rehearsed responses to challenging combinations of conditions. These traits also involve organizing, integrating, and managing information, emotions, and other cognitive and affective functions that lead to “doing the right thing” in situations that do not have a predetermined or formulaic driven response.

These functions are especially important to highly capable people because of the positions of power to which they typically ascend.

A number of researchers have pointed out the importance of incorporating these noncognitive skills into everything from curricular experiences (Cordova & Lepper, 1996; Diamond, 2010) to educational assessments (Levin, 2011; Sedlack, 2005) and college admission considerations (Sternberg, 2005). These skills have important implications for the academic success of students, career decisions, and even the economic productivity of nations. Although not minimizing the importance of traditional cognitive ability, these authors point out that conventional assessments account for a small portion of the variance when examining long-term academic and career accomplishment, especially as it relates to the advancement of adult competencies in highly demanding professions where leadership skills and creative productivity are the criteria for success.

A good deal of the background material that led to the inclusion of executive functions in this overall talent development model comes from the field of human resources (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Heckman & Rubenstein, 2001). These authors point out the importance of noncognitive skills in personal and social as well as academic development and—more important for this overall theory—a meta-analysis showed that these skills could be taught. Initial input was also derived from the literature on social, behavioral, and “emotional intelligence” (Goleman, 2006). Goleman argued that great leadership works through noncognitive traits such as self-awareness, self-management, motivation, empathy, and social skills. Although the research literature on these types of noncognitive traits is massive, there is general agreement that the following so-called “Big Five” personality traits (Almlund, Duckworth, Heckman, & Kautz, 2011) are the basis on which education intervention programs should focus:

- (1) *Openness*—Inventive and curious as opposed to consistent and cautious;
- (2) *Conscientiousness*—Efficient and organized as opposed to easy-going and careless;
- (3) *Extraversion*—Outgoing and energetic as opposed to solitary and reserved;
- (4) *Agreeableness*—Friendly and compassionate as opposed to cold and unkind; and,
- (5) *Neuroticism*—Secure and confident as opposed to sensitive and nervous.

Our research to date on this subtheory has included the development of an instrument called *Rating the Executive Functions of Young People* (Renzulli & Mitchell, 2011). This diagnostic instrument is designed to assist in research dealing with the types and degrees of executive function traits in young people and can be used both to identify potential leadership traits in young people and help teachers determine which curricular experiences can develop desirable leadership traits in individuals or groups. Subsequent diagnostic techniques may include simulations to determine successful performance in demanding problem-solving situations.

Themes that emerged as contributors to success from the review of research conducted in the process of instrument development included mindfulness, ethical/moral, social, motivational, and leadership traits as well as the so-called Big Five personality traits or factors mentioned. Also identified were specific traits such as being eager to learn, studious, intelligent, interested, and industrious and other variables such as positive and realistic self-appraisal, preference for long-range goals, successful leadership experience, and community service. Researchers in other domains have also identified noncognitive variables of persons who lead and make a difference. For example, in reports on the characteristics possessed by some of the most altruistic persons in American society, common traits that were demonstrated by most of these individuals included passion, determination, talent, self-discipline, and faith. Leadership, ethics, accountability, adaptability, personal productivity, personal responsibility, people skills, self-direction, and social responsibility have also been identified as critical skills in the literature dealing with 21st century skills, as were professionalism, enthusiasm, leadership, positive work ethic, values, decisiveness, team-work, character, support, conformity, openness, self-concept, anxiety, and life-long learning.

This overwhelming list of traits that emerged from the literature review were grouped into five general categories as a result of a factor analysis of data collected from several hundred respondents using the instrument mentioned above. The first factor is Action Orientation, which includes specific characteristics that motivate an individual to succeed. The second factor is Social Interactions and it includes traits that enable someone to successfully interact with others. The third

factor is Altruistic Leadership, and it includes characteristics relating to both empathy and dependability. The fourth factor, Realistic Self-Assessment, includes characteristics that demonstrate awareness of one's own abilities, realistic self-appraisal, and self-efficacy. Finally, Awareness of the Needs of Others subsumes sensitivity, approachableness, and strong communication skills. Taken collectively, all these behaviors characterize highly effective persons, but they also reflect traits that cause people who have emerged as leaders in their respective fields to "do the right thing" in the arenas and domains over which they have had an influence.

The implications for including executive functions in a theory about the study of giftedness relates to the anticipated social and leadership roles that high potential young people will play in their future endeavors. Embracing executive functions also has significance for the types of programs and experiences that should be provided to develop these skills and the roles and responsibilities of curriculum developers and service providers. The relative newness of this dimension on the parts of scholars in the field is obviously in need of more research and there are many opportunities for creative implementation practices and original research related thereto.

Summary

Gifted education, like all other specialized areas in the arts and sciences, is constantly in search of its identity. What defines a field beyond random and trendy practices are the theories and related research that delineate its parameters, promote future research, and have an impact on *defensible* practice. Our field has been notably "thin" on theory development, and the work offered here is just one approach that I hope will promote discussion among scholars and practitioners, generate research on the validity of the ideas and concepts discussed here, and inspire more theoretical development on the parts of other scholars.

The most salient point to make when discussing and generalizing about theories for the study of giftedness in the 21st century is that there is an overlap and an interaction among cognitive, affective, and motivational characteristics. We cannot divorce these numerous and interactive characteristics from the ways we should go about developing gifted behaviors in young people. Developing the intelligences outside the normal curve is as important to the contributions that our field can make as have been the traditional academic markers of successful gifted programs.

A second and final consideration deals with how we should go about producing leaders for the 21st century. This consideration deals directly with how gifted education should differ *qualitatively* from general education. People who have gained recognition as gifted contributors in the beyond-the-school world have always done so because of something they did — an invention, a sonata, a design, and a solution to a political or economic problem. They brought myriad traits to bear on their respective challenges, and it is these types of experiences that provided such opportunities that should be the core of our efforts to educate tomorrow's people of great promise. The anticipated social roles that people of high potential will play should be the main rationale for both supporting special programs and designing learning experiences that will prepare today's students for responsible leadership roles in the future.

In my opinion, the biggest challenge in gifted education is to extend our traditional investment in the production of intellectual and creative capital to include an equal investment in social capital and the development of executive function skills (see Subotnik, Robinson, Callahan, & Gubbins, in press). I believe that experiences designed to develop these skills should begin at early ages and focus mainly on direct involvement rather than "teaching-and-preaching" experiences. If we can have an impact on social capital and effective and empathetic leadership, then we will be preparing the kinds of leaders who are as sensitive to human, environmental, and democratic concerns as they are to the traditional materialistic markers of success in today's world. And the greatest payoff from focusing gifted education on investigative learning and using knowledge wisely will be a dramatic increase in the reservoir of people who will use their talents to create a better world.

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An Innovative Resilient Strategy towards Creatively Teaching Mathematics

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Abstract

Although teaching mathematics is complicated due to a wide range of crises stemming from its complex nature, the beliefs about mathematical ability and skills, the use of ICT tools in problem solving and socio-economic disruptions, current approaches focus on how to use problem solving activities such as experimenting, questioning and working collaboratively in order to build methods to increase students' facility in comprehending and learning mathematics.

In this paper, we conjecture that significant improvements in teaching mathematics can be obtained by addressing the challenge of proposing a resilient strategy that involves activities based on the concepts of proximity. Since mathematical notions must be semantically close to each other, regulation, for mathematical rules and principles should be presented clearly and explicitly, and, governance of the teaching procedure is also important, meaning that the teacher ought to control the information flow presented in class, independently from the subject being taught and the context (i.e., heterogeneous groups of learners).

From the students' point of view, resilience can be defined as their ability to respond to learning crises, for instance, overcome low self-esteem, be self-organized and build self-efficacy, whereas, as far as the teacher is concerned, resilience can be defined as his/her capacity to be transformed in different contexts, like interactive material, alternative teaching methods and multi-faceted skills in crisis management.

Keywords: Resilience; math teaching; scenario-based approach.

Introduction

Currently, many researchers and practitioners in a wide range of disciplines maintain that the key to learning mathematics in today's world is an educational environment where students (especially those at-risk) can maximize their self-efficacy, that is, the belief that one has the capacity or power to learn; it is predicated on having a positive view both of the subject itself and of one's own abilities to master it (Robinson, 2012).

A theoretical construct related to this critical issue of maximizing students' self-efficacy, especially in mathematics education, is resilience. It is literally defined as "a dynamic process of interaction between socio-cultural contexts and the agency of developing individuals" (Howard et al., 1999), but it simultaneously involves many different interpretations, depending on the context where it is applied. Some studies place this notion of resilience in a context of risks (Abelev, 2009), while others in a socio-cultural perspective (Edwards & Apostolov, 2007).

In this paper, we interpret resilience along with three core elements (i.e., proximity, regulation and governance) within a mathematics educational environment. In order to ensure that the instruction the teacher provides is responsive to the shifting demands of the 21st century, we propose a resilient strategy towards teaching mathematics based on scenarios.

Theoretical framework

The study was framed by the following notions: conceptualization of resilience, types of risks within mathematical education environments, and strategies for “resiliently” teaching mathematics.

Conceptualization of resilience

The term resilience stems from the early psychiatric literature that examined children who appeared to be invulnerable to adverse life situations (Earvolino-Ramirez, 2007). Resilience is later considered as a dynamic process consisting of a series of ongoing, reciprocal transactions between the child and the environment (Luthar & Zelazo, 2003). The Free Dictionary defines resilience as “the power or ability to return to the original form, position, etc. after being bent, compressed, or stretched; elasticity”, or “ability to recover readily from illness, depression, adversity, or the like; buoyancy”, and the Free Merriam Webster Dictionary defines it as “the ability to recover from or adjust easily to misfortune or change”. A common point among these dictionary definitions is a sense of recovering despite adversity or change.

Over time, this concept has received significant attention from various domains and a variety of disciplines utilize it (Shaikh & Kauppi, 2010). For example, as the ability or power to return to the original form or position, after being changed, resilience in the context of a truly resilient organization has to maintain function throughout the change event and also return to a state as if unaffected by the change when it is removed. In this perspective, resilience must be identified by introducing the contextual dimensions needed.

Despite the growing body of research in the area of conceptualizing the term of resilience, this study aims at correlating core elements of resilience in mathematics education, in a precise way, in the hope that greater conceptual clarity will lead to a range of appropriate interventions that benefit students in learning mathematics.

In this perspective, we consider three core elements of the term resilience that may guide its extension within mathematics education:

- **Proximity**, that is, mathematical notions must be semantically close to each other. Mathematical concepts need to be aligned in order to be understandable by the students. The teacher must start from an already known concept and then continue to the introduction of the new one, by highlighting their common features or their main differences. This feature of resilience is essential because it makes connections among concepts and procedures and relates ideas to situations or phenomena drawn from other contexts;
- **Regulation**, that is, mathematical rules and principles must be given in an explicit and clear way. This can be successfully obtained, if the teacher uses clearly the mathematical dictionary and gives meaning to any mathematical statements. The basic idea behind this feature of resilience is to communicate thinking orally, visually and in writing, using vocabulary and a variety of appropriate representations and observing conventions; and,
- **Governance**, that is, the teacher must control the information flow within the classroom. This can be achieved by using techniques such as guided questioning, technology-based activities, encouraging reflection on mistakes and misconceptions rather than dismissing an answer as wrong, promoting sharing of ideas, using specific everyday problems as starting points, etc. To help deepen understanding, the critical point is to develop and apply reasoning skills to make conjectures, justify conclusions and construct organized arguments.

Based on these core elements involved in the term resilience, we propose in the last section of the paper, a scenario-based teaching approach which aims at developing mathematically resilient learners who develop a positive stance towards mathematics.

Types of risks within mathematical education environments

Although resilience research has identified a number of different risk factors, including psychopathology, socioeconomic disadvantage, etc., that are related with negative outcomes in

children, they are not equivalent in severity (Vanderbilt-Adriance & Shaw, 2008). Especially, in a mathematical education environment, the main risks to be defined include:

- Risks involved with the complex nature of the subject to be taught (Jaworski, 2010);
- Risks referring to innate beliefs about mathematical ability being fixed (Dweck, 2000); and,
- Risks related to the teaching process and the overall classroom climate (Nardi & Steward, 2003).

In summary, many people find it difficult to take part in mathematical learning, to the point that they exhibit phobia or anxiety, or at least avoidance from engaging in any activity that could require mathematical reasoning (Ward-Penny et al., 2011; Eden et al., 2013). While students' at-risk success and failure are dependent upon a number of influential factors (e.g., poverty, health, and other social conditions), it is evident that instructional practices (e.g., participation in extracurricular experiences) and the classroom learning environment (e.g., facilities, exposure to technology, etc.) are contributing factors (Waxman et al., 2003).

Resilient strategy for teaching mathematics

In this section, after presenting some efforts of educational approaches that aim at developing resilience characteristics in students, we propose a scenario-based teaching approach, which may lessen the risks involved in mathematics education.

Strategies for “resiliently” teaching mathematics

Researchers need to identify strategies which can help in building students' mathematical understanding, as well as their resilience, that is, their positive mathematical self-perceptions. Besides, being a resilient student of mathematics means that the student has a set of qualities that foster a process of successful adaptation and transformation despite the risk and adversity involved in mathematics education.

In Thornton et al. (2012), the processes of mathematisation, that is, the use of mathematical models and representations of real world contexts and contextualization, i.e., the embedding of mathematical ideas into a meaningful context, are proposed as key aspects for developing mathematical resilience, especially among aboriginal students.

In Lee & Johnston-Wilder (2013), mathematical resilience is described as “a learner's stance towards mathematics that enables pupils to continue learning despite finding setbacks and challenges in their mathematical learning journey”. Authors state that a particular resilience is needed in order for the students to learn mathematics, because of various factors that include: (a) the nature of mathematics; (b) the beliefs about mathematical ability; and, (c) the types of teaching.

In Brain & Mgombelo (2013), the importance of the problem-solving approach in teaching mathematics is highlighted with the aim of developing resilience characteristics in students. In the same study, it is further underlined that amongst the specific characteristics of a resilient mathematics learner are: (a) developing self-confidence; (b) regulating emotions of mathematical anxiety and struggling to succeed; (c) remaining persistent by struggling in solving problems; (d) using resources around the classroom; and, (e) clearing misconceptions and incorrect solutions.

In Hernandez-Martinez & Williams (2013), resilience of mathematics students in transition from a socio-cultural perspective is examined. Moreover, some protective factors, such as support of a peer group, a support programme and a special teacher are proposed in order to be incorporated in pedagogical processes that may encourage reflexivity in students.

Although, recently, there is a substantial body of literature that considers resilience as an essential theoretical construct on which many pedagogical approaches may be based, there is not a clear proposal of a teaching method. In this perspective, we propose a scenario-based approach which is documented according to the three core elements of resilience, as they are described in the previous section.

Extension of resilience within mathematics education through a scenario-based teaching approach

In the context of a resilient strategy, a scenario-based teaching approach is proposed. It extends the basic building blocks of the definition of resilience, that is, proximity, regulation and governance and it lessens the risks involved in mathematics education. The basic idea and the added value of this approach are described, in detail, within the scenario proposed in this subsection.

Scenario: Calculation of an area bounded by a function

The cognitive area that is covered by the proposed scenario refers to the mathematics of the last year of tertiary education, as well as, at the early stages of college studies. The main mathematical concepts that are dealt within this scenario are: Function, Area, Definite Integral, and Indefinite Integral.

First of all, the subject to be taught is given to the learners through a pragmatic problematic situation. More concretely, the subject of the proposed scenario is presented by the question: “Can you calculate the area (Figure 1) bounded by a river side (straight line), two straight streets, vertical on it, 5m apart from each other and another intersecting curvy road?”

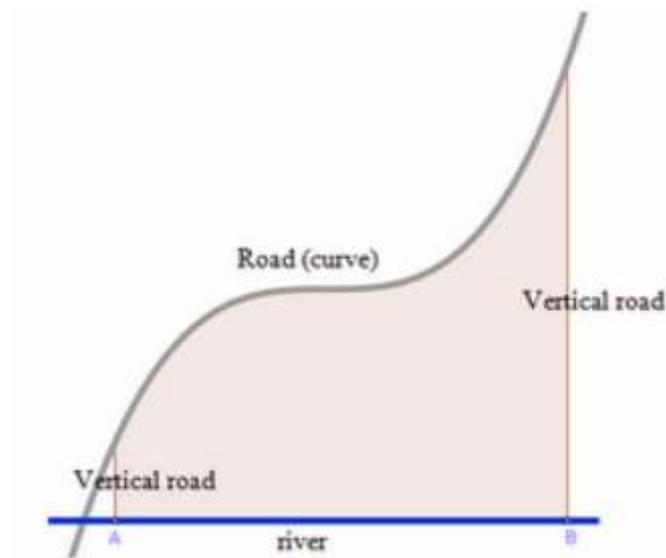


Figure 1: The region and area to be calculated.

In a rigorous mathematical language, a similar question can be put as follows: The four sides of an area (see Figure 2) are determined by, a river bed (straight line), its two verticals 5m apart one from the other and a fourth side, which is a segment of the function $f(x) = ax^3 + b$, as it is shown below. Can you find a method for calculating this area for various values of the parameters a and b as well as for various positions of A and B on the curve?

In this case, as far as the students are concerned, notions such as those of *the definite integral* and *anti-derivative* of a function are not connected with an explicit and comprehensible way. In most related textbooks the connection between these two notions is usually presented via a theorem, known as the **Fundamental Theorem of Calculus** (Anton et al., 2002), which is introduced without any justification and proof, also requires from the students to possess an in-depth comprehension of both notions that constitute the integral-area of a region and the anti-derivative of a function, but to interconnect them (see Figure 3). As a result of this difficulty, the students try to learn by heart, without fully comprehending the concept.

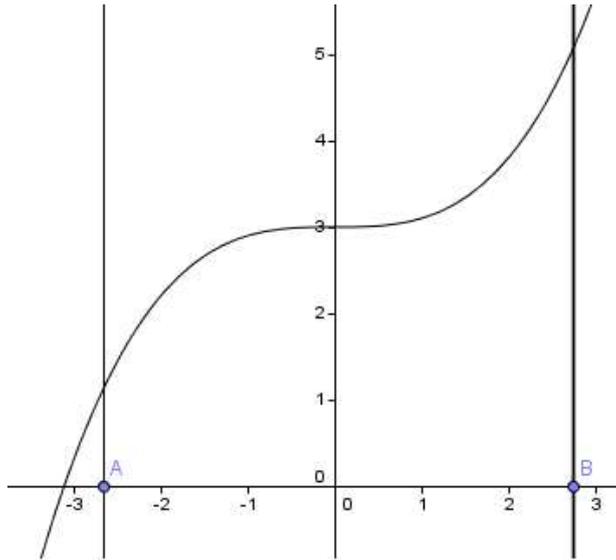


Figure 2: The area under the curve.

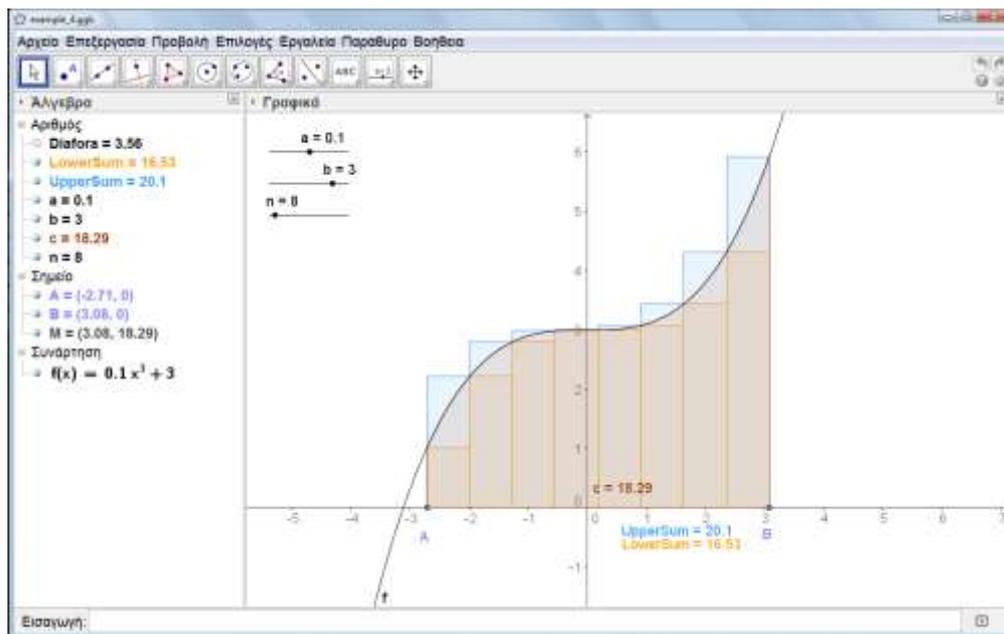


Figure 3: The integral - area.

In contrast to the standard approach of teaching these mathematical notions, the basic idea of the proposed innovative resilient strategy is that, instead of presenting the subject to be taught in strictly mathematical terms, a real problem is described. Thus, all types of learners are activated, since there is no anxiety or fear of unknown mathematical concepts or misunderstanding calculating rules, they are able to observe the visualized object, and, in addition, they are free to collaborate for drawing conclusions. More precisely, with the proposed scenario – innovative resilient strategy, the students will be able to interconnect these two notions with a tangible and dynamically handling way. They are called to: a) define the region, for which they are to calculate the area and, to do so through the process of partitioning by Riemann (Anton et al., 2002), b) to find the function F , that is, the anti-derivative of the function f . Through these actions in concatenation, the students will learn that the point fixed by the two coordinates (that is, the horizontal coordinate referring to the point B , while the

vertical coordinate referring to the area of the region) approximately belongs to the initial function (see Figure 4).

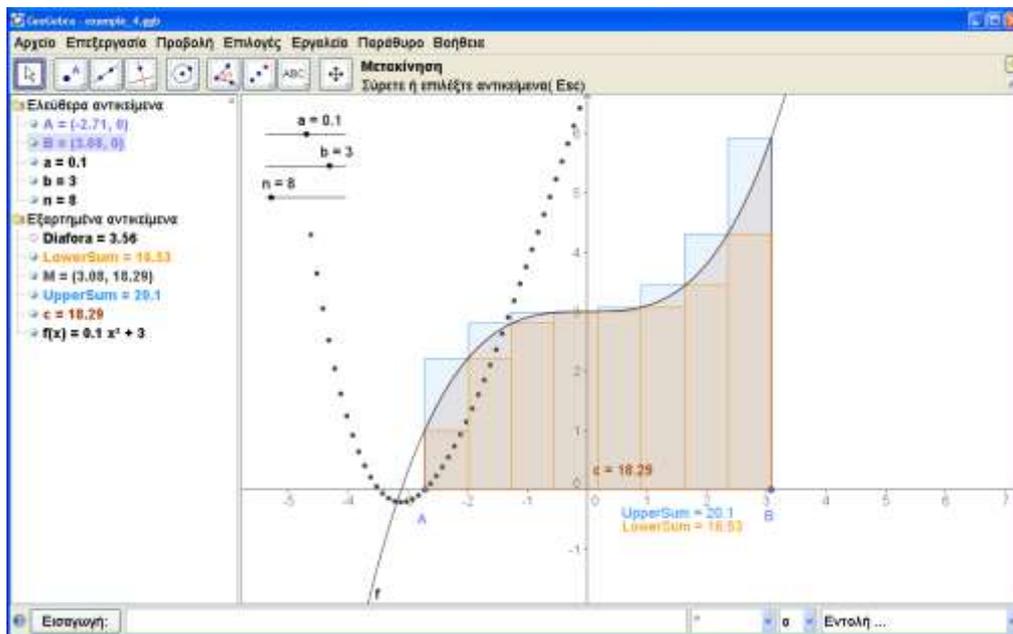


Figure 4: The points fixed approximate the initial function.

With the proposed strategy, the use of this educational scenario not only constitutes an innovation in the traditional framework of teaching of that particular mathematical concept, but also tries to influence students' learning abilities even further. More precisely, it tries to contribute to the change - improvement of the students' attitude towards Mathematics and the process of approach. The students are expected to realize that Mathematics can be the subject of modeling real problems and in particular each student will be able to experiment with, in this framework his/her own ideas and draw his/her own conclusions, which should have social acceptance within the framework of a creative classroom and a strictly defined scientific field. The use of technological tools, in our case the GeoGebra software, is expected to considerably facilitate the desirable educational goals. Moreover, working in teams, the continuous and constituted collaboration between the students of each team, obviously will contribute to the change of their attitude towards learning.

The teacher, who will include in his/her teaching the proposed scenario, will have the opportunity to try modern instructive and pedagogic methods that will contribute to the improvement of his/her attitude towards the daily, "boring" school routine and will teach important concepts of Mathematics in the framework of the scenario that, among others, constitutes a science laboratory environment.

The teacher's contribution to the scenario requires change to his/her role and from a traditional one, a "know all" teacher, is required to become a creative collaborator with his/her students, a reference point concerning the guidance of research and the scientific validity of the students' conclusions, as well as, an innovative and productive researcher. A wider acceptance of change of the roles of both students and teachers is required, by the whole school community, in order for the proposed scenario to be successfully applied.

Furthermore, the school administration ought to be aware that the application of modern/innovative teaching methods, with the assistance of Digital Technology, requires a different attitude towards the school operation. For instance, it may require certain teams of students to meet and work in the school beyond their standard curriculum. This should, in some way, be ensured and, moreover, the students must be encouraged in every effort to use technological means in favor of

learning and teaching. Hence, the educational process is improved and the school acquires a more concrete role in the framework of the socio-cultural learning.

It is scientifically realized that the students have difficulties in comprehending the concept of definite and indefinite integral, as well as, in interrelating the two in an explicit way. To this direction, GeoGebra (<http://www.geogebra.org/>) facilitates them to progressively comprehend the notion of the definite integral through the partitioning in, as much as possible equal partitions, of the area (Figure 3) and, moreover, conceptualize the anti-derivative function F (Figure 4).

Another significant point to consider is the social instrumentation of the classroom that is obtained by applying the proposed strategy. The students, working in teams and guided by a worksheet, are called to create and explore particular graphs and to answer specific questions. Consequently, this investigation will be done in groups. In order for common objectives to exist and a good collaboration between them, the students are called to complete a common worksheet that contains questions relative to the subject. Naturally, it is supposed to provide students enough freedom so that they provide their own questions and answers to them. During the implementation of the scenario the teacher should check the students' conclusions, collaborate with them, guide them so that they better comprehend their results and encourage them to continue their productive work.

In addition, it is interesting to quote the achieved goals of the suggested innovative strategy.

- The proposed activities, in combination with the forecasted methods of didactics described, aim at providing students with the potential, on behalf of the cognitive object to: (a) Comprehend the notion of the definite integral and connect it to that of the anti-derivative, (b) comprehend the way of calculating the area of a region bounded by the function f , (c) comprehend the way with which the area is altered by changing the position of the points that define the region, (d) comprehend the way of the mutual change of the two magnitudes, that of the right utmost region and its area and also to describe algebraically this change.
- From the pedagogical point of view the students: (a) will learn to experiment with the mathematical concepts (area of a region, partitioning it into equal parts, approaching the area through the number of partitions, mutual change, function etc.), by questioning and making various hypotheses, (b) will be given the opportunity to organize the data they collected so that they are facilitated in drawing conclusions, (c) will learn to collaborate with the other members of the team, in order to discuss their observations, organize their conclusions, formulate rules, register their data, create relations that connect different magnitudes, present their work to the other teams, (d) build codes of communication so that they become perceptible to the other members of the team, as well as the rest of their schoolmates and the teacher.

Concluding remarks

This study extends the conceptualization of resilience within mathematics education, claiming that a scenario-based teaching approach is the most resilient one, since (i) it is based upon the concepts of proximity (the mathematical notions are defined, semantically close to each other), regulation (the mathematical rules and principles are given in an explicit and clear way) and governance (the teacher controls the information flow within the classroom), and (ii) it lessens the risks related to the complex nature of mathematics and the stereotype that mathematics is for the few.

The innovation of the paper lies in two main points: (a) the consideration of the scenario-based approach as a creative strategy, since it refers to a battle, which we intend to win with the available resources (animated or not), and (b) the embedding of the concepts of resilience, which is used as a theoretical construct related to issues of anxiety, fear in applying mathematics and building self-efficacy.

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Character and Expression of a Musical Piece in Foreign Language Teaching to Children

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Abstract

The author explores the interdisciplinary use of music in teaching English as a foreign language to children in the context of function, genre, character and expression, trying to decipher the role and influence of music on various contexts of language learning, such as memory and concentration span, and takes under consideration a wide variety of musical aspects. From earliest childhood, active listening is perceived as an ability that helps a child to develop sensitivity to facilitate the acquisition of many skills, not only related to music. This assumption should lead to the list of the most idiomatic determinants – the elements of a specific *dialogue* between a musical piece and a *listener-learner*: the child. The question whether multi-stimulating senses of a child and the development of sensitivity to Art leads to easier assimilation of a foreign language as well as leads to the general assimilation of information remains flowing and open. The idea of applying classical music to foreign language teaching draws on recent research into the interrelation of expression, verbal emotions and mood in the fields of musical perception and foreign language learning. The features of a musical piece are discussed in the context of intuitive and active listening to music against the techniques and methods used in foreign language teaching in early childhood such as *total immersion*, as well as in the context of linking emotional reactions to music to early vocabulary acquisition. The author hopes to provoke further research into musical properties which may influence the methodology in the above mentioned area.

Keywords: Learning foreign language; teaching foreign language; English as a second language; music theory; music education; music and language; non-verbal communication.

The interdisciplinary ways of teaching English are still at the centre of attention of scientists of various disciplines, therefore, it should not be unusual that this subject is undertaken by a music theoretician.

Further reflections will focus on a general study of the constructive usage of not only music with words but also pure instrumental music in foreign language teaching in two contexts: *the character* and *the expression* of a musical work. The text will not, of course, even partially exhaust the topic but at least may extend the attempts to answer a question: what else can be researched in the area of effective foreign language teaching?

The selection of chosen methodology includes such aspects as: humanities, development of reading, development of language creativity, foreign language teaching (*glottodidactics*), the studies on *expression* and *nature* of music (named here as *character*), and research on the relationship of music and emotion.

The methodology of humanities assumes a cognitive linguistic approach dealing with assimilation, collection, and usage of information, proving that language is closely related to mental processes involved in perceiving the world. Its main task is to explain not only language skills, but also social competencies enabled by language usage. *Research in the development of reading* show that the greatest potential for intellectual development of the child's brain exists in the first four years of its life since neuron units are considered to be 50% formed at the age of four years, 70% at the age of 6 - 7 years, and about 80% in eight year-old children. *Studies on the development of language*

creativity focus on linking analogical and metaphorical methods (*per analogy* and *per metaphor*) with one of the basic mechanisms of the process of creation. The essence of these two types of thinking is based on associating similarities between objects and phenomena in the familiar, simple and specific and in what is unknown and abstract.

A modern approach to *teaching foreign languages* is based on concepts of integrated education and developmental psychology (Pamuła, 2009). As it is known, many methods and techniques of teaching English have been developed so far and among the most popular are: *conventional methods* (such as the grammar – translation method, the direct method, the audiolingual method or the cognitive method); *unconventional methods*, such as the silent way, suggestopedia, community language learning and total physical response; *communicative approach* such as the Widdowson's communicative language and teaching, content based instruction, task - based instruction and participatory approach; and *complementary approaches* such as: learning strategy training, cooperative learning and multiple intelligences (Szewczyk, 2004). The methodology of teaching foreign languages such as glottodidactics emphasises the importance of emotions in language learning. The following statements of Barbara Anisimowicz and Mirosława Stawna underline this approach:

“Teaching and learning a foreign language is more than just a cognitive process, thus, emotional factors should be also taken into account in studies on the effectiveness of various cognitive factors”. (Anisimowicz, 2000)

“Through the usage of functional or conceptual programmes, using the method of communicative language teaching, learner should grasp the meaning of a sentence at first, and then the grammatical rule”. (Stawna, 1991)

In the studies on expression and character in music, it often happens that the definitions of character and expression are used as synonyms. Although, in the field of music these terms are similar to each other, they cannot be used interchangeably: the difference seems to be subtle but cannot be missed as character can be understood as a set of internal and unique qualities of the music piece, that are different from the expressive external formal qualities which bring music to a single design. According to Mieczysław Tomaszewski expression is a manifestation of the character of music as the emotional load through which the composer communicates with the recipient of his work and the character becomes a static phenomenon, whereas the expression – the dynamic phenomenon (Tomaszewski, 1978).

Thanks to expression, music is perceived as a distinctive speech that thrills our hearts and can be explained as an inherent element of things or phenomena, the ability of suggestive expression of feelings in Art, and an external sign of feelings or spiritual experiences.³⁴ Johann Georg Sulzer pointed out *Ausdruck* is the soul of music and without it, music becomes merely pleasant fun. The methods of research into expression can be various, for example, based on the expressive markings, the so-called *expressive didascalias*, provided by the composer himself; based on the documents or statements of the authorities; or through the analogy of the similar places in the scores.

Mieczysław Tomaszewski points out the qualities of the character that differentiate the nature of the musical piece, introducing the concept of ‘a specific value’ that is: *differentia specifica*. The methods of research into the character of a piece of music are mainly based on the concepts of many theoreticians and composers themselves, such as: Friedrich Schlegel, Jean Paul, Robert Schumann, Wili Kahl, Martha Vidor, Erwin Bodky, Elfriede Glusman, Arnold Schoenberg, Constantin Floros, Eero Tarasti, and Michał Głowiński (Poland).

³⁴ Jarosz K., „Polska miniatura skrzypcowa czasów romantyzmu i modernizmu. Od Karola Lipińskiego do Grażyny Bacewicz. Charakter utworu muzycznego w świetle recepcji”, *doctoral research*, AM w Krakowie, Kraków 2014, p.18.

The exploration of the affiliation of music and emotion is still at the centre of interest of contemporary researchers: musicologists and music psychologists. John Sloboda, Patrick N. Juslin, Andreas Lehmann, and Robert H. Woody prove that expressions and emotions in music – here shown in the context of foreign language teaching – resonate in the future: the child combines and associates the designates of expressions and emotions that are verbally determined in English as a foreign language, and associates meanings with emotions that are brought by music. As a result, it is easier to remember those designates: words, sentences or phrases in a foreign language. Andreas Lehmann writes that:

“As we know from general psychology, memory is context – specific; that is, we not only learn a specific content but also remember the learning environment, psychological condition, and so forth, associated with it”. (Lehmann A.C., Sloboda J.A., Woody R.H., 2010).

As it is known, music carries the entire spectrum of emotional phenomena. Although the reception of these phenomena can be very subjective, one can extract basic emotions, as well as their ‘shades’, and assign them to different ‘characters’ in the context of either the entire musical piece or separate musical passages. The words of Joseph Kerman justify this process:

“Verbal messages included in the musical composition, have every right to be taken into account along with their contents equally with the analyzed forms of sound.” (Kerman, 1994)

Keith Oatley and Jennifer Jenkins (1996) distinguish the spectrum of emotional phenomena based on the duration of each of them: seconds, minutes, hours, days, weeks, months, years, even the period of a lifetime. According to the scheme submitted by these two authors³⁵ expressions last seconds; verbalized emotions, minutes and hours; moods, weeks and months.

During the process of perception such a way of interpreting can be related to a musical piece:

- *Expressions* may refer to the smallest moments lasting seconds, expressed by a specific technique, melody or harmony (or all of them);
- *Verbalized emotions* may refer to parts expressed by *expressive didascalia*; and
- *Moods* may refer to the general nature of a musical piece.

Patrik N. Juslin and John Sloboda (2010) point out:

“Emotions and moods may contribute to the development of memory and remembering. To distinguish between different degrees of emotional states and their intensity, the following terms are used:

- affect
- emotion
- mood
- feeling
- arousal of emotion
- induction of emotion
- perception of emotion”.

It is proven that memorizing will become easier to a child if a word or a phrase to remember corresponds to a particular emotion, in other words, if it is put in some specific context. The teacher, helping the child to name these emotions, should be able to extract them and make a typology, such as the typology of expressive qualities. In the process of making such a typology, a couple of aspects may be taken under consideration such as: the *hippocratic typologies of characters* of Immanuel Kant or Wilhelm Wundt (based on: Gasiul, 2006) distinguishing four main characters and their associated feelings of activities such as: choleric, melancholic, phlegmatic, sanguine; *theories (or typologies) of characteristics*, such as the theory of states by Hans Eysenck, introducing unstable states against the

³⁵ Strelau J., *Psychologia. Podręcznik akademicki*, t.2, D. Doliński (Ed.), Gdańskie Wydawnictwo Psychologiczne, 2008, p.343.

stable ones: the neurotic personality against emotional stability, or introversion against extroversion; or the *tables of expressions*, for example, the popular *Wheel of Emotion*, by Robert Plutchik

As it is known, from the earliest childhood, listening is the ability that helps a child in developing sensitivity to facilitate the acquisition of skills that are not only related to learning music. Through proper presentation of the world of sounds around, through paying attention to music, a child's sensitivity to Art is developing and the senses are being stimulated, and learning a foreign language, as well as the general assimilation of information, becomes facilitated. It is said that the child listens straight through the heart and not through the brain, does not analyze, does not interpret, does not even listen with understanding. So the child sees the music through imagination and through feelings. As noted by Leszek Polony:

“Music, like love, belongs to the realm of psychic awareness. Musical awareness interiorize physical phenomenon of the sound, constitutes the cadenza of these sounds, deciphering ethos and expression.” (Polony, 1978)

The child naturally finds and senses this Ethos, taking any content intuitively, always truly and sincerely. The child's mind goes through the path, adequate to perception and motoric reaction to the sound, that Mieczysław Tomaszewski, while discussing an entirely different matter, called ‘emotional’. According to Tomaszewski, motoric reaction is manifested by:

- “... motion: walking, running, hiding, and some other reactions resulting from:
- The wish to escape or attack: as the audio equivalent of pre-verbal expression;
 - Mimics as the equivalent of pre-verbal *onomatopoeia*; and,
 - Or gestures as the equivalent of pre-verbal games of sound ornamentation”.
- (Tomaszewski, 1978)

Taking all above into consideration it is vital to emphasise the importance of musical material selection that enables the child to grasp and name character – expressions and emotions carried by music that can be put in the context of a particular state of perception. Searching for some paths in this matter, it is of the primary importance to precisely provoke a situation like “total immersion in music” in order to observe the child's response: emotional or motoric. Following this path, a teacher should be able to determine which emotions accompany each musical part. How do children behave in response to it? What do they see in their imagination? How do they move?

The most important objective of the research is to answer the following set of questions:

- Whether children memorize their own reactions to music, and link them to specific musical situations?
- Whether, through these situations, they respond (emotionally or through movement)?
- Whether through their response they associate specific situations with words and sentences?
- Whether they memorize these words and sentences and can repeat them in analogical musical situations?
- Whether all of the above can speed up the process of learning?

At this point I would like to underline two different situations:

- The main, wordless situation, where a "pure" emotion is carried by music; and,
- The process of assigning these emotions to the group of positive, or negative terms.

The expression and nature will reflect an inner character of music and excitement that this music brings. Mieczysław Tomaszewski points out that:

"What carries the Art of Art is either a reaction of a subject to the entity, that is the reaction of a man to the world, or a reaction of a subject to a subject, or a person to a person. In the first type of reaction - a subject to an object, the world, nature, the event, there is no need for words. The sound manifestation of such a reaction includes a pure expression - scream of fear, laughter, joy, cry – or pure “onomatopoeia” and imitations of the sounds of nature such as: voices of birds and other animals, atmospheric phenomena; like an echo and a cliché documenting the dependence of the man on nature; or a pure sound-play as a

combination of sounds forming the vocal ornament, arabesque, wordless vocalise, humming, whistling wondering and amazement to the world". (Tomaszewski, 1978)

I underline this once again: by "character" I mean in this case what is inside the music and what is delivered to the outside by expression, and by "expression" I understand emotions received by the child and presented physically, through gestures or mimics. Thanks to this, memorizing, such as placing a particular word or phrase in the context will be easier.

Highlighting the two main aspects: The expression and the character in the system of organizing the musical material one can distinguish at least five contexts:

- Source context: That is, what exists in the musical score;
- Musicological context: That means the analysis and interpretation of the musical work and musicological research;
- Intuitive context: The context of one's own interpretations where one can follow the music material and adjust it to the meanings which can be later used for teaching purposes (but always according to their "nature": it is obvious that we do not use the tarantella's fiery passages to illustrate silence and calmness);
- Reception context: That means research related to the theory of reception; and,
- Perception context: that is, empirical studies related to the research in perception.

As far as source context is concerned one should take into account the composers' or editors' annotations, for instance a distinctive title visualizing familiar models from the surrounding world of nature such as *Carnival of Animals*, *Flight of the Bumblebee*, *the Bee*, etc.; emotional load that relates to the expressive *didascalia*, such as *con fuoco*, *dolce*, *con vigore*, *appassionato* etc. and is emphasized by distinctive technical measures, such as *pizzicato*, chords, accents; dynamics (*forte - piano*, *crescendo - diminuendo*); rhetorical phrases (ex. *tirata*); agogical changes (*largo*, *allegro*, *accelerando*, *agitato*, *calando*, etc.); or contrasting form (like in *Polish Capriccio* for violin solo by Grażyna Bacewicz)

As far as musicological research is concerned the teacher can refer to: genealogical research, such as the nature of genre (lullaby - lyrical, tarantella – lively); general nature of the musical piece, such as illustrative, programmatic, lyrical or choreic, or many variants which refer to, for example temperament: fiery, impulsive, joyful, sad; or agogics: fast, slow, etc.; general function, such as referential, expressive, impressive, phatic, based on Roman Jakobson's model which was distinguished for music purposes by Mieczysław Tomaszewski (2005) in relation to the main functions of a piece of music in 'the space of culture'.

As far as intuitive context is concerned one can forward one's own conclusions based on one's own selection of musical fragments, such as illustrative or affective ones, regardless of the general nature of a musical piece (see: "*Wee Sing and Pretend*" by Pamela Conn Beall and Susan Hagen Nipp, 2001, 2002). In this case, musical material is treated like a carrier of intended meanings for teaching purposes – so it is idiomatic. It is obvious that if a teacher wants to rely on *expressive didascalias* that are included in the musical score they must choose a musical piece that would transmit those expressions clearly. If the child associates emotions with words, these emotions must be readable and understandable and so the musical piece needs to be of a characteristic nature. The message must be clear so that the child can immediately associate a particular piece of music with the appropriate character. For example, the easiest way is to contrast musical sections reflecting different basic emotional states:

love – hate
fear – anger
happy – sad
anticipation – surprise
merry – miserable

In relation to all of the above, at this level it is not essential that the choice of musical pieces or parts - nor their interpretation - be correct from the musicological point of view, but it is essential that it reflects clear and understandable emotions the child can feel in immediate response to the music - and that those emotions refer to the words that will be pronounced and memorized.

It is crucial that the sound material is friendly and natural to the child’s world, although some more difficult pieces (such as 21st century pieces) with a transparent transmission can also be included. Some examples are presented below (for internet sources please see references).

Table 1: Symbols transmissions.

Sharpness	Gentleness
K. Penderecki, <i>Cadenza</i>	C. Debussy, <i>La fille aux cheveux de lin</i>
Danger	Expectation
K. Penderecki, <i>Metamorfosen</i>	R. Wagner. <i>Tristan und Isolde</i>

Internet sources provide countless opportunities for selecting sounds with pictures. At this level, similarly, one can freely interpret and use for didactic purposes examples of musical works, such as:

Table 2: Sound with pictures transmissions.

Mountains	Wojciech Kilar, Orawa
snow, winter	C. Debussy, <i>Footprints in the Snow / Des pas sur la neige - Preludes, Book 1, No. 6</i>
The moon	Claude Debussy, <i>Clair de Lune</i>

As far as reception context is concerned one can take into account what has been said and written about a piece of music in concert/recordings reviews, newspapers, monography etc. (see Romuald Starkel’s anecdote); in stories, legends and tales; in scientific articles and books, etc. For example, a wealth of the reception expressions are related to *Myths* by Karol Szymanowski or Romuald Starkel’s anecdote, quoted after the *Tygodnik Ilustrowany* (Table 3 and 4).

Table 3: The context of reception, *Myths* by Karol Szymanowski.

920	M. Skolimowski	“poetical poems for violin-piano”, “Szymanowski himself: an esthete, in love with charming fairy-tale visions”
922	Zdzisław Jachimecki	“extraordinary palette”, “fantastic harmony”
969	Józef M. Chomiński	“captivatingly beautiful”
980	Teresa Chylińska	“They emphasize above all the composer’s musical imagination Powerful expressive charge and rich colors”
005	Bohdan Pociąg	“lush”, “born of wealth and thrust of creativity”, “shaped asymmetrically, developed widely, capricious in narrative, variable in movement, pace and rhythm. The melodic lines and shapes of sound are "Art Nouveau" flexible, sinuous, flowing, Plant-like stems, branches, buds, leaves, flowers ... That the music seduces us with sensual splendour of the early summer. We can almost see the beauty of the musical piece as if it were a painting, billowing and twinkling with different shades and nuances of colour”.

As far as empirical research and perception context is concerned a musical piece is a subject that generates a variety of contexts based on empirical research and tests of expression or the level of its illustrativeness or lyricness.

Table 4: Context of reception, *The Legend* by Henryk Wieniawski.

Vocabulary: love, father, husband, daughter romance, wife, family, children.	“ the genesis of the <i>Legend</i> does not lack in romantic elements: Sir Hampton, originally against the marriage of his daughter, Isabella, with Wieniawski”, as Józef Reiss recalls from the novel by Romuald Starkel <i>The Legend – a real event in the life of the artist</i> , which appeared in “The Illustrated Week” from 1880 approached Wieniawski after the concert in which Wieniawski performed <i>The Legend</i> and said: “Only a true love can explain such inspired music with which you spoke to us today. I am convinced that nobody can love my daughter deeper. Therefore, I do not wish any other happiness for her and would be honoured to call you my son-in-law”.
Musical piece: Henryk Wieniawski, <i>The Legend</i>	

The topic of the influence of music on foreign language teaching is worth further studies and research into the relations between a musical piece and long-lasting effects of memorizing, long-term memory. Following the theory of integrated education, English teachers could or maybe should extend their linguistic knowledge and experience to other areas and benefit from the knowledge and experience that musicologists possess. Armed with such strong methodological and theoretical bases, they would be constrained by nothing but their own imagination.

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Karolina Jarosz graduated from the Faculty of Musical Education at the Academy of Music in Kraków (AMK). Under the direction of Dr. hab. Magdalena Długosz, she defended the Master's thesis entitled *Musical computer programs for ear training* and evaluated this degree in the United States. She also completed a doctoral seminar at the Institute for Educational Research by the Ministry of National Education in Warsaw; and the Theory of Music Doctoral Studies at the Academy of Music in Kraków. In 2011 she received a scientific grant from the Polish Ministry of Science and Higher Education and obtained Doctoral degree at the Academy of Music in Kraków for thesis entitled *Polish Violin Miniature of the romanticism and modernism era. From Karol Lipinski to Grażyna Bacewicz. The nature of a musical work in the light of its reception*, written under the supervision of prof. dr hab. hc Mieczysław Tomaszewski. Her interests focus on the works of Polish composers and violin pieces of the XIXth Century with the special attention of function, genre, character and expression. As a teacher she has been leading Music in English classes for children 0-12 years old and applies her knowledge and experience to the curricula.

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Successes and Failures in a Sixty-Year Career Trying to Understand Human Intelligence

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Abstract

In this article, I describe successes and failures I have had in a 60-year career trying to understand intelligence. I started working on the problem in elementary school and am still working on the problem, 60 years later. My research has gone through a series of stages, described in the article. Although I have succeeded in pointing out a way for education in general, and gifted education in particular, to improve, I have been much less successful in effecting the implementation of my ideas.

My career studying human intelligence began in 1956, 60 years ago. I realize this makes me sound rather advanced in years, but you have to take into account that my career started when I was 6 years old. When I was growing up in the 1950s and 1960s, the school gave group IQ tests every couple of years, starting in first grade (when I was 6). I regularly performed poorly on these tests, often not even finishing the first page of a multi-page test booklet. Sometimes when children take tests, they are not sure how well (or poorly) they do. In my case, there was no doubt in my mind. In those days, I was extremely test-anxious, although the school never attributed my poor scores to test anxiety; rather, they inferred that I was extremely stupid. My teachers treated me like I was stupid; I acted stupid; they were happy that I was meeting their expectations; I was happy that they were happy. Everyone was very happy.



I acquired an interest in intelligence. What was it? How was it tested? Why did I do so badly on intelligence tests? I've always been interested in things I do badly (Sternberg, 2014). In elementary school, I tried to learn about intelligence tests. Each year, I also wrote a "book" with exercises children could use to improve their intelligence. I wrote at the bottom of each book that it was published by "JJ Books," a company of my own invention. Of course, none of the books was ever really published.

Elementary school might have been a total disaster were it not for my fourth-grade teacher. She believed there was more to a child than an IQ test score. I really liked Mrs. Alexa. If I were not so young and she were not married, I would have thought we had a future together. Anyway, I wanted to make Mrs. Alexa happy, and in fourth grade, when I was 9 years old or so, I became an excellent student. The school obviously still had its suspicions. When I was in sixth grade, I was sent back to a fifth-grade classroom with 10 year olds to take the IQ test because the school administrators thought the sixth-grade test would be too hard for me.

By seventh grade, at age 13, I was ready to do a science project on the development of mental testing. I did the project and invented my own intelligence test, the Sternberg Test of Mental Abilities (STOMA). Of course, it was never published and never really used. I also gave some friends the Stanford-Binet Intelligence Scales, which I found at the town library. The head psychologist of the school system found out about my ill-fated venture and scolded me for close to an hour, threatening to burn the test if I ever brought it into school again. That scolding cemented forever my desire to study intelligence for a career, and I continued doing projects studying intelligence in high school and college. The psychologist really should have known better—children are always attracted to things and people that are forbidden to them.



I went to college at Yale. As an undergraduate, I became interested in university admissions (Sternberg, 1972, 1973), an interest that has remained throughout my life. I then went to graduate school at Stanford to pursue the *Ph.D.* At the time (and still today), there was no one in the psychology department of either university who was interested in intelligence. Even Lee Cronbach, a professor in the Stanford School of Education and an expert in assessment (see, e.g., Cronbach, 1990), told me that the field of intelligence was pretty much dead at the time (1972). So, I started off my graduate career doing research on free recall (unordered recall of lists of unrelated words—Sternberg & Bower, 1974). Very dull! However, after my first year of graduate school, I got the idea for my dissertation on intelligence, and so re-started my career studying human intelligence.

My dissertation (Sternberg, 1977a, 1977b), and my early work as an assistant professor at Yale, were on what I called the componential analysis of human intelligence. The basic idea was that traditional psychometric analysis of IQ tests could tell us about individual differences in factors of intelligence but it really told us nothing about the mental processes underlying intelligence. My goal was to

understand those mental processes. The research was fairly successful and helped me understand how people could be extremely intelligent yet fare relatively poorly on IQ tests (Sternberg, 1977b, 1980). For example, they could be excellent analogical reasoners but not know what the words meant in the analogies with which they were presented. As a result, they would fare badly not because of lack of reasoning skills but

because of lack of knowledge of the meanings of difficult words, especially for non-native speakers.

I studied many tasks using componential analysis (Sternberg, 1983) but eventually concluded that I was on the wrong track. I was studying IQ test problems from a processing standpoint, but my experiences working with students convinced me that there is more to intelligence than what the IQ tests measure. As a result of these experiences, I formed the triarchic theory of human intelligence (Sternberg, 1984b, 1985, 1988), according to which intelligence is a combination of analytical abilities as measured by conventional intelligence tests, but also of creative and practical abilities, which are not measured by such tests.

Early on, I found that a career in the field of intelligence, with an especial interest in students at the high end (gifted students), was not an easy sell. When the book based on my dissertation (Sternberg, 1977b) was sent out for prepublication review, a reviewer savaged it. I was lucky the publisher published it at all. It later became a citation classic. I then found my colleagues at Yale and in my field of cognitive psychology more generally skeptical of research on human intelligence. The field did not have a good reputation among experimental psychologists — then or now. So I constantly had to be persuading my colleagues that the work I was doing was truly scientific. When I came up for tenure, in my fifth year at Yale, I heard gossip that some of the outside referees who were consulted by Yale were saying that it was not worth giving a permanent position to a person in the field of human intelligence. I persisted nevertheless, although with trepidation. I did indeed get tenure, although the path was rocky at best.

The greatest problem in the early years was not with skeptical colleagues but with data. Actually, the data were quite good, but they had a problem (Sternberg, 1977b, 1983). When I correlated scores on components of information processing with scores on psychometric tests, the highest correlations were with the regression constant, or whatever it was that did not vary across the different kinds of analogies or series problems or other items I used. What had seemed like it would be the least important

information-processing component actually proved to be the most important. In other words, I had “rediscovered” general intelligence, or *g*, in looking at variation across stimuli instead of variation across people (Sternberg & Gardner, 1982).

Clearly, something was missing in the work I was doing. Eventually it became moot. In observing the students I was teaching at Yale, I came to realize that my whole approach was too limited. One student, whom I came to call Alice, was extremely good at standardized tests and also had very good grades. She was a gifted student, but she had great difficulty coming up with an idea for a dissertation and the idea she eventually came up with was certainly nothing special. Another student, Barbara, performed poorly on standardized tests but showed herself to be highly creative. A third student, Celia, was excellent with respect to figuring out how to give job talks — she was offered every job she applied for — but was neither terribly good analytically nor particularly creative. So out of these experiences came my triarchic theory of intelligence, according to which intelligence comprises analytical, creative, and practical aspects (Sternberg, 1984b, 1985).

I thought I’d figured intelligence out with that theory, but I was wrong. When I observed high achievers, they did not excel merely because of some weighted combination of analytical, creative, and practical skills. Rather, they seemed to have in common that they figured out what they did well and what they did poorly, and found ways of capitalizing on strengths and compensating for weaknesses. In particular, they were people who could figure out what they wanted in life and then set about achieving it, given the sociocultural constraints within which they operated. I referred to people whose lives reflected these skills as successfully intelligent. Now I thought I understood what differentiated more from less intelligent people (Sternberg, 1997).

After some years, I realized that the theory of successful intelligence as I had formulated it still was inadequate. The reason was that, the more I observed people in the world, the more I realized how intelligent people could be foolish (Sternberg, 2002, 2004b). As I write this article, the United States is in an

election year, and if one wants to observe intelligent people who are foolish, there are few better places to look than among our candidates for office. One candidate is a habitual liar—he just cannot seem to get himself to tell the truth about anything. Another candidate announces plans to build a wall separating the United States from Mexico and force Mexico to pay for it. There is no indication of how or why Mexico would pay for such an absurd scheme. Another candidate, when told he was robotically repeating what he had said before, again and again, robotically repeated yet again what he had said before again and again. And still another candidate seems to become embroiled in

scandals with the regularity of a carefully adjusted and regulated clock. Many of these candidates attended Ivy League universities—among the best in the United States. Their problem is not a lack of intelligence, but rather, a lack of wisdom.

Of course, terrorists provide an even more compelling example of individuals who often are intelligent but unwise. So I augmented the theory of successful intelligence to include not just analytical, creative, and practical skills, but also wisdom-based skills (Sternberg, 1998, 2003b). I argued that intelligent people are especially susceptible to foolishness precisely because they believe that they are not.

As time went on, I came further to realize that an essential element of wisdom is ethics (Sternberg, 2010b, 2012). Without positive ethical values, one cannot truly be wise. So I emphasized the role of wisdom and ethical values in successful intelligence.

Although I believe analytical, creative, practical, and wisdom-based skills are keys to intelligence anywhere, I do not believe they can be measured in the same way everywhere. My colleagues and I have done research on five continents showing that one needs to take into account the sociocultural context in which children grow up adequately to measure their intelligence, or the intelligence of adults (Sternberg, 2004, 2007; Sternberg, Jarvin, & Grigorenko, 2011). How people conceive of intelligence can vary from time to time and place to place (Sternberg, 1984a, 1990). For example, the theory of general intelligence notwithstanding, we found that in rural Kenya, level of knowledge relevant to environmental adaptation (i.e., knowledge of natural herbal medications used to combat parasitic illnesses) was *negatively* correlated with scores on a measure of general intelligence (Sternberg, 2004; Sternberg et al., 2001). We found in studying Yup'ik children in rural Alaska that knowledge of adaptive skills was uncorrelated with scores on tests of fluid abilities (Grigorenko et al., 2004). Even among business people in the United States, practical knowledge was not correlated with IQ-based measures (Sternberg et al., 2000). So to the extent one defines intelligence as the ability to adapt to the environment, one cannot measure general intelligence according to some IQ test put forward as universally applicable and obtain a measure that signals a high level of adaptive skills in real-life environments (Sternberg, 2014).

We have found it exceedingly difficult to effect changes in the ways intellectual skills are measured. For example, in the United States, measures called the SAT and ACT are used very widely for college admissions. These tests are basically IQ tests in disguise (Koenig et al., 2008). We have developed measures that can be used for college admissions that improve prediction of college grade-point average and that simultaneously reduce ethnic-group differences (Sternberg, 2010a). But it nevertheless has been exceedingly difficult to persuade colleges and universities even to try out our (or other) new measures (Sternberg, 2010a, 2016). Universities are so entrenched in the ways they measure aptitude for college that they just do not want to change what they do. Similarly, our attempts at convincing schools to teach for successful intelligence (Sternberg & Grigorenko, 2007) have met with limited success. Schools generally do not want to rock the boat with respect to their need to improve students' test scores. At the same time, although we have had success in teaching for successful intelligence on a small scale (Grigorenko, Jarvin, & Sternberg, 2002; Sternberg et al., 1999, 2014; Sternberg, Torff, & Grigorenko, 1983), our success on a large scale has been more limited (Sternberg et al., 2014). Our programs cannot work unless very assiduous attention is paid to teacher training.

Although my efforts to effect significant changes in school practices have met with limited success, I believe others have been more successful, especially Sally Reis and Joseph Renzulli (2014;

Renzulli & Reis, 2007) and Howard Gardner (2006, 2011). So it can be done. Many others have succeeded as well (see essays in Sternberg & Davidson, 1986, 2005). But the pressures in education, at least in the United States, are such that it is truly difficult to get change to endure. For example, in the United States, there is such a great emphasis on standardized test scores that schools have ended up teaching to the tests, and the tests do not measure the broader range of skills that have appeared in theories such as mine (see also Sternberg 1993, 2003a; Sternberg & Davidson, 1983; Sternberg & Grigorenko, 2001), or Renzulli's or Gardner's.

So, I think my own contribution has been to point a way in which education could be improved; but it has not been seen actually to have much effect on that education. As a dean at Tufts University and a provost and senior vice-president at Oklahoma State University, I was able to make meaningful changes. However those were only two universities, leaving tens of thousands to go!

Looking back on my career, I have been successful in some ways: many citations to my work, numerous awards and prizes, a number of honorary doctorates, and teaching at some great universities such as Yale and Cornell. In other ways, I have not been so successful. In the scientific domain, I believe I've come nowhere close to my mentors — Endel Tulving, Gordon Bower, and Wendell Garner — in scientific eminence. In terms of acceptance of my theory of intelligence, I'm light years behind Spearman (1927) and Carroll (1993). I believe the most successful researcher on intelligence today is probably Ian Deary (see, e.g., Deary, Whalley, & Starr, 2008). Although he is a believer in IQ, his studies are far beyond the mindless research that keeps finding that IQ predicts something meaningful. In the educational domain, unlike Renzulli and Reis (2007) and Gardner (2011), I'm hard pressed to think of a school using any of my programs. I spoke earlier of the importance of wisdom in a career and in life. A large part of wisdom, I believe, is coming to accept the goals one has accomplished but also the goals one has not accomplished, and realizing that there may well be those who come after oneself who accomplish the goals that one never quite reached. I have five children and have taught many students, and I have no doubt that they will achieve many of the successes that have eluded me! On top of it all, I'm a mere 67 years of age and there still is time to hope that I will be able to accomplish in what is left of my career some of the things that have eluded me over the past 60 years. Given that my wife and I have 6-year-old triplets, there still have to be a number of years left to my career so I can pay for the children's college education!



I believe that, in the long run, there is hope. Maybe some educators who care about the disenfranchised will realize what a grave disservice they are doing to millions of students every year. Maybe society will realize that problems such as global warming, terrorism, creeping dictatorships around the world, and choking air pollution are not and will not be solved by high IQ. It may not happen while I am alive but I have five children, they will have children, and I hope in a generation soon, your children and mine will live in a world that recognizes that gifts go not only “beyond IQ” (Sternberg, 1985), but way beyond IQ. Unfortunately, it is not clear how long we, as a civilization have. If we don’t learn some time soon, climate or terrorists or narcissistic dictators or air pollution may not allow for a “next generation.”

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Can you explain what motivated you to enter this field?

As a child I wanted to be a teacher, and as a result, I often annoyed my friends by offering to conduct lessons and give them instructions about this and that. I carried this desire into my university years by taking the required coursework for teacher licensure including practice teaching in a local school. However, before applying for my professional certification, I decided to enroll in a Master's program at Teachers College, Columbia University to help me feel more confident about going into the classroom. The first person I encountered when I went to register was Dr. Abraham Tannenbaum, and meeting him transformed my educational pathway.

I met Dr. Tannenbaum by chance (and those of you who know his work will especially appreciate that fact). I had stopped into the Special Education office to get directions to the general education office and Dr. Tannenbaum was greeting students. Before I could ask for the directions I was seeking, he asked with a warm smile about my own schooling up to that point. My pathway through public school gifted programs intrigued him, and then he said the magic words, "I want you in my graduate program." Who could resist? Dr. Tannenbaum was an outstanding mentor and lecturer, and his outlook on giftedness and talent influenced me profoundly. Most particularly, he awoke a deep interest in how talent develops, and the possibility for me to contribute to this exciting area of scholarship and practice.



When did you start working in this field?

In the 1970s I was living in Seattle, temporarily teaching at a private early childhood center. One weekend during a volleyball game I met, by chance, the coordinator of the Seattle Public Schools Gifted Education Department. I told her about my Master's degree in gifted education and my newly acquired teaching license that allowed me to work in local schools. She told me about a position that had opened up teaching gifted 11-12 year olds and asked me to apply right away.

What I found most intriguing about the Seattle gifted program for which I was hired (another program was operating concurrently that served high IQ children), was its use of multiple sources of information about potential participants, beyond requisite achievement, creativity test scores, and teacher recommendations. Parents, students in the school and school staff were asked to nominate children who showed the best sense of humor, the most creativity, as well as those to whom others went for help with their schoolwork. This led to a pool of wonderful candidates, some of whom I continue to correspond with to this day. The teachers in the building were all hard working and idealistic and we cooperated to ensure that the students in my program were adequately challenged in all their subjects and throughout the day, not just the one hour a day they had with me.



Unfortunately, this dream job did not last because the building was needed for another program and the students and teachers in the existing school were disbursed to schools throughout the system. I rebuilt the program in another building for three years and was faced again with a move ordered from the central office. This time I decided to step away from teaching and accepted an offer to enroll as a full-time doctoral student and teaching assistant at the University of Washington, hoping to focus on teacher education and research with gifted students. I was grateful for the four intensive years of engaging with pre-university students. These were some of the most memorable years of my life. However, chance factors and new options helped me move on to a different stage of my career – one in academe.

Will you please shed some light on the first few years of your career?

After teaching in Seattle and completing my Ph.D. I looked for a job at a university where I might work with teachers, conduct research, and write. I was lucky to get one of very few openings in the country that year (1984), however, the experience required some adjustment for a “city girl.” The location was in a very rural area with a good university but poor resources for all but a few schools. Although it was challenging to live someplace with few urban amenities, I made the best of it. I'm sure the locals must have thought I was a bit weird because my style is so direct while West Virginians are very courtly and less blunt in how they interact.

Eventually I was able to make some good friends and fully enjoy the students and my colleagues. I also learned some important lessons about how giftedness can be manifested in different cultures and circumstances, and how threatening the label of gifted could be for marginalized families and communities who worried about losing their children to mainstream culture.

I still longed to get back into an urban university. My wish came true in 1986 when I was invited to become an Assistant Professor at Hunter College in New York City. Beyond the return to my home town, the professional opportunity was terrific. Hunter College had a loosely affiliated laboratory school associated with it, one with a storied reputation as a site for 1,600 academically gifted children grades preschool through 12. Although the College's mission was not in line with that of the laboratory school, it was equally compelling to me – as a non-selective higher education institution for working class strivers to have a chance to shine. I found an apartment that afforded me the chance to walk to work through Central Park and I felt as if I was the luckiest person on earth.

What kind of major challenges did you face in your fields of work?

After the initial euphoria of finding the perfect job in my home town, I faced some challenges that surfaced within the second or third year of my arrival. The period from the late 1980s through the 1990s was a time during which American education was experiencing pushback against policies emerging from *A Nation At Risk* (ANAR) (1983), an education policy paper released by the Reagan administration. ANAR shined a devastatingly unflattering light on pre-collegiate public education and the poor preparation for university and work that a majority of American students were receiving. It also highlighted how little attention was paid to the nation's most able students. As a result of the attention, our field experienced a golden era – think about Sternberg's Triarchic Theory, Feldman's Coincidence Theory, Gardner's Multiple Intelligences, Tannenbaum's Star Model, Renzulli's Three Ring Conception, Gagne's DMGT. Unfortunately, unlike the gifted education community, the general education community responded to ANAR with a defensive crouch, to the point where some educators actually argued that traditional academic achievement was a value being imposed on poor and minority students by the middle class.

Many of my general education department colleagues viewed the gifted laboratory schools as profoundly elitist and an embarrassment to Hunter College, and the lab schools took their own defensive crouch. I was caught in the middle. As a distraction from this painful set of circumstances, I capitalized on professional experiences and opportunities in New York as much as possible. I reached out to other selective schools both private and public, collecting data and engaging with their issues. I also delved into the world of arts performance through a study of classical music at Juilliard, and later, with Linda Jarvin, at other prominent conservatories in Boston and Philadelphia. Since then, the ideological pendulum has swung back and forth a few more times, and now conditions are equally suffocating for general education, but not quite so much for gifted education.

What are your most significant accomplishments and contributions?

The general theme of my contributions has been to promote talent development in domains, and also seek useful and workable applications learned from performance domains and apply them to academic and professional domains.

For example, a lot of my work focused on specialized science high schools as well as with music conservatories. Both locations address a different set of high level talents, and have different outcomes in mind. But there are some overarching components that take place in both locations, and these themes have informed my contributions to the evolution of the Mega Model of Talent Development that I developed with Paula Olszewski-Kubilius and Frank Worrell.

More specifically, I am particularly proud of my contributions to the following:

In 2009, Paula, Frank and I were invited to submit a special issue of *Psychological Science in the Public Interest* on the topic of giftedness. This invitation was one of the biggest honors of my life because of the impact of the journal and the support provided to us as authors was very generous in terms of funding and editorial services. Later our article was selected for *Scientific American* magazine in abbreviated form, twice! The most important scholarly treat that emerged from the project for us was to conduct a review of the psychology literature on talent, giftedness, and creativity in domains, and present a comprehensive definition of giftedness and a new model for talent

development. We called it the Mega Model because it synthesized in a new way various aspects borrowed from the scholarship of others who came before us. The main tenets of the Mega Model are the following:

- Ability is important in talent and giftedness, most especially domain specific talent;
- Abilities are malleable and need to be developed;
- Giftedness is a relative term, and whether one is called gifted varies over time as it refers to potential, achievement, and finally creative productivity or eminence;
- Different domains begin, peak and end at different times;
- In order to develop talent that transitions from abilities to competencies, from competencies to expertise, and beyond, opportunities must be provided to talented individuals;
- Talented individuals must take those opportunities;
- Psychosocial skills (mental and social skills) are an essential component of talent development, and the role played by psychosocial skills in successful talent development increases over time; and,
- The aspired goal of gifted education and talent development is to provide the information and opportunities needed for those who wish to pursue an eminent career.

The definition we provided: *Giftedness is the manifestation of performance that is clearly at the upper end of the distribution in a talent domain even relative to other high functioning individuals in that domain. Further, giftedness can be viewed as developmental in that in the beginning stages, potential is the key variable, in later stages, achievement is the measure of giftedness, and in fully developed talents, eminence is the basis on which this label is granted. Psychosocial variables play an essential role in the manifestation of giftedness at every developmental stage. Both cognitive and psychosocial variables are malleable and need to be deliberately cultivated.*

A majority of our efforts are now focused on addressing missing pieces of the research and practice puzzle associated with the Mega Model. For example, how do you identify promising talent in each domain, how do you train psychosocial skills, how do you set up gifted education so it is long term in its orientation and prepare professionals for this new role?

My scholarly involvement in the creation of the Mega Model came from deep exploration of education in two domains: Science and Music.

My dissertation served as the foundation of a longitudinal study of talent development in science, beginning with finalists and semi-finalists of what was then called the Westinghouse Science Talent Search (until recently called the Intel Science Talent Search), the most prestigious American competition for adolescents. I followed the winners from age 17 to age 35. In the course of this work, I became especially aware of how important it was to socialize novice scientists into values and customs of the scientific enterprise. It also became clear to me that how well my study subjects dealt with setbacks and recognition was important to their success, yet unless they were lucky enough to find supportive mentors they were very much on their own with regard to socialization and psychosocial skills development.

More recently, I was the principal investigator of a study of secondary institutions that serve gifted adolescents interested in science and engineering. Twenty five schools were involved in the study and the most interesting outcomes paralleled those of the Westinghouse study. The outcome measure of interest for us was completing a university degree in science. The contributing factors turned out to include having a mentored research experience, and having a parent working in the sciences. These mentors and scientist parents were clearly able to provide socialization into the field. We are currently analyzing the data to explore the factors that led participants who did not have a parent in the sciences to still get a degree in the sciences.

In between, I invested a couple of years observing and interviewing teachers and students at elite music conservatories. Linda Jarvin and I went into this project looking for how elite talent is

cultivated in a performance field, with a special focus on psychosocial development. We always had in mind looking for lessons we could bring back from music performance to the world of academic talent.

We learned that many, if not most essential psychosocial skills are viewed as teachable and not inherent to the person, and are promoted explicitly in coursework and through coaching. We also learned that most of the skills we identified were introduced and mastered at different times according to need. For example, many conservatory students arrive filled with self-confidence, something that was reinforced by their admission to such a competitive program. After they arrive and assess the performance of their classmates, many lose their self-confidence and much of their conservatory career is devoted to finding a way to deal with that loss. Through practice and coaching, students learn that whether or not they truly recoup their self-confidence, they will need to present themselves to audiences as if they are totally self-assured. The outcomes of this study were extremely informative to the Mega Model.

Finally, I am very proud to have increased the awareness of giftedness, talent development, and high performance in youth at the American Psychological Association. I certainly did not accomplish this alone, but I have maintained a steady focus on this area as a member of the staff since I arrived in 2001. I can see that attitudes are changing, and the topic is taken far more seriously among my colleagues and APA members. As icing on the cake, the American Psychological Foundation has supported me and Frank Worrell in our efforts to organize a coalition of psychologists that focus on projects related to high performance. It is a total joy for me to participate in these conversations with psychologists who specialize in sport, surgical and other high stress teams, artists, gifted students, and elite military groups. The group is exploring competition, gatekeeping, and psychosocial skills needed for high performance.

Every day is a new adventure and I appreciate this opportunity to reflect on how I got here.

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Book Review (1):

Our Kids: The American Dream in Crisis

Robert Putnam (2015)

Stephen Hornstein; John Hoover

St. Cloud State University, USA

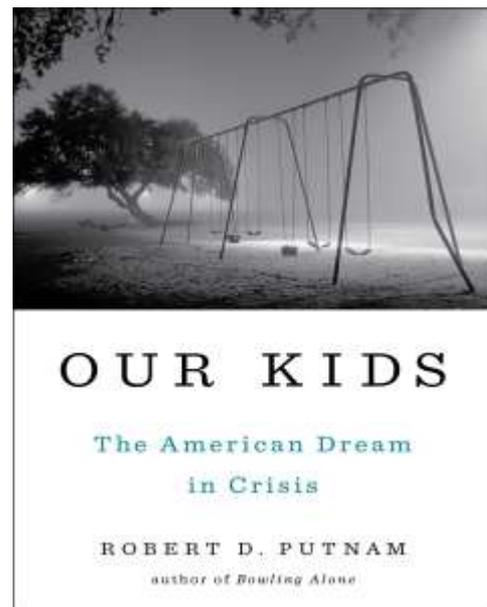
A long period has passed since we have so strenuously recommended a text to our colleagues and students. *Our Kids*, with the apt subtitle of *The American Dream in Crisis* (Putnam, 2015) represents an apposite follow up to his classic volume *Bowling Alone* (2000). In *Bowling Alone*, Putnam established that America had entered a period of perilous disconnection. In *Kids* he extends this communitarian thesis by laying out data on the well-being of youngsters and families as the gap between rich and poor surges. The theme tying it to *Bowling* is posed in a question implied by the title: As a society, will we conduct ourselves as if the plight of poor youngsters is owned by all?

Professionals in education and the human services will want to add *Our Kids* to their personal libraries. Because of the book's potential to initiate conversations, we have taken the liberty of adding related resources for the purpose of further study. We envision lively and fruitful discussions held in university programs and at professional conferences. This volume has the potential to initiate a compelling international conversation about the effects of inequitable distribution of income and wealth. In fact, Putnam and President Obama participated in such a national forum on the family effects of rising income inequality (with the American Enterprise Institute's Arthur Brooks; Politico, undated; for an unabridged version of the panel discussion on poverty, held at Georgetown University on May 12, 2015, go to:

https://www.youtube.com/watch?v=vaGnNQ6Jr_8).

It is perhaps noteworthy that discussion participants suggested that liberals and conservatives enjoy shared turf when speaking of families' well-being.

Putnam challenges the nation to engage with an ethic of generosity. As is true of the spirit of generosity applied to individual children, Putnam shows that failure to bring poor families into society's mainstream produces enormous costs. Citing the work of Belfield, et al. (2012), we discover that the direct burden of poverty over the course of the study on taxpayers runs to 1.59 trillion dollars, with an estimated society-wide cost of 4.75 trillion. We are paying more for poorly-designed, half-hearted efforts than we would for programs essentially alleviating poverty. Putnam does a masterful job of explicating the differences between the lives of children and adults from lower income backgrounds and those of the middle class. Putnam convincingly demonstrates that the differences do not track along racial, ethnic or cultural lines. Although more minority and immigrant families exist within the lower income group, the lives of minority and immigrant families in the middle class are more similar to other middle class families than they are to the lives of minority and immigrant families in the low-income group



Our Kids consists of an extraordinary but effective mix of essentially three components, (a) stories of the specific experiences of families representing the upper-middle class and poor skillfully integrated with (b) research data (more on this later), and (c) a passionate final chapter dealing with solutions. Putnam relates the stories of young people and families from either side of the widening SES gap, starting with his home town of Port Clinton, Ohio. The storying of the experiences of specific youngsters, mostly in their own words, exquisitely engages certain readers—those who best visualize issues and their solutions through narrative; these accounts truly bring the SES gaps to life.

A sociological researcher, Putnam is most comfortable organizing and presenting data illustrating the effects of the increasing gap between rich and poor in the United States and, presumably, elsewhere. This piece, interspersed with the stories makes up the middle two-thirds of the volume. Via figure after figure, Putnam convincingly demonstrates that, from the last quarter of the 20th century to the present, two populations have come to exist in the U.S. For those in the middle class and up, most indicators (of social goods) have risen (or remained constant), while those occupying the 25th percentile and down have shown the opposite trend (e.g., participation in politics, children residing in single-parent home, education of mothers, employment and income, verbal/parenting versus authoritarian parenting, participation in extracurricular activities, adaptive language). For example, from birth lower income children have fewer verbal interactions with parents and family members resulting in slower and less robust language development. This of course, leads to significantly lower school achievement. Children and families in the low-income group tend to live with a great deal more stress from a variety of sources. It may come from the neighborhood in which they live, it may come as result of parents having to work multiple jobs to make ends meet, or it could result from the complex family relationships often seen among members of low income populations. In any event, research shows that stress impedes brain development; thus, many poor children will achieve less in school.

Putnam places the blame firmly on economic policies that have produced an ever-increasing income gap producing an increasingly-frayed social fabric. This fraying cloth is profoundly important; in the early 1970s, the daughters of custodians and bankers attended school together and lived reasonably close to one another. The soft skills of working together toward social ends, once learned in integrated schools, no longer occurs as the two social groups travel ever more divergent pathways. This produces a noxious social and political estrangement between classes, with the well-off finding it difficult to identify with the plight of the poor.

A few writers have complained that Putnam fails to stress the role of wealth and power in *producing* the gaps that he discovers. DeParle (2015) for example, makes the argument this way:

What he [Putnam] omits, however — sometimes maddeningly — is a discussion of the political or economic forces driving the changes he laments...You'd never know from *Our Kids* just how radically income inequality has grown; how much influence the wealthy now exercise in politics; and how well they protect their stakes. (We do hear a lot, by contrast, about the importance of family dinners.) To frame inequality, as Putnam largely does, as a product of inadequate empathy and weakened civic institutions is to overlook the extent to which it's also a story about interests and power.

The big ideas. The above being noted, we think that his series of suggestions (Chapter 6, What can we do?), as modified below reflects a positive approach to moving out of the morass we currently experience based on economic inequality. First, we have to abandon the closefisted notion that money won't help. All of the suggestions below will cost money. If we are magnanimous (building a politics around the spirit of generosity) enough as a nation to address this issue here is where we would begin (some of the ideas are from the book, others are from our teaching).

- High quality, free, pre-school for all low income three and four year olds. This isn't a panacea but it could begin to address the gaps in language. Current programs don't serve enough

children. If these programs were full-day and had affiliated day care it might allow parents to work and ease some financial pressures as well

- Smaller class sizes and more para-professionals to insure students' needs are met
- A high quality curriculum that includes music, art, PE and recess for all children. Middle class children often get these benefits while poorer children do not, leaving them farther behind
- Development of schools as community centers to provide after-school opportunities for children and families, e.g., parent education, and healthcare
- Significantly more counselors, psychologists, ELL teachers and translators in schools. This could help with stress issues or help more kids find their way into appropriate colleges. The psychologists would help expedite special Ed placements and help with mental health issues while the translators and ELL teaches would ease the transition for second language students and help their parents communicate with school officials.
- An end of “pay to play” in extracurricular activities (This comes directly from Putnam). However, if we really believe that these kinds of team/ group activities are so crucial why aren't they part of the curriculum? We recommend that every student should be engaged with some sort of activity for the last period of the school day.
- Mentorship programs for kids in all high schools. These could be from the community or from local colleges and universities. We think it is particularly important that members of the immigrant communities attending universities and colleges mentor younger members of their communities.
- An expansion of the earned income credit. Again this idea comes directly from Putnam. Research evidence exists that even relatively small amounts of money (several thousand dollars annually) can make a big difference in the stress level of families and hence the achievement of children. Expanding the earned income credit could do this.
- A national program to insure that schools are physically adequate and safe. Many children still go to school in buildings that most of us would find unacceptable (Jonathan Kozol, 1991, has thoroughly documented this). Why on earth do we as nation tolerate this?

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About the Author

Robert D. Putnam is the Peter and Isabel Malkin Professor of Public Policy at Harvard University. To keep up with his events and travel, please continue to visit this website. In addition to teaching, he is a member of the National Academy of Sciences and the British Academy, and past president of the American Political Science Association. He has received numerous scholarly honors, including the Skytte Prize, the most prestigious global award in political science, and the National Humanities Medal, the nation's highest honor for contributions to the humanities. He has written fourteen books, translated into more than twenty languages, including *Bowling Alone* and *Making Democracy Work*, both among the most cited publications in the social sciences in the last half century. His 2010 book, co-authored with David E. Campbell, *American Grace: How Religion Divides and Unites Us*, won the American Political Science Association's 2011 Woodrow Wilson award as the best book in political science. He has consulted for the last three American presidents, the last three British prime ministers, the last French president, prime ministers from Ireland to Singapore, and hundreds of grassroots leaders and activists in many countries. His latest book, *Our Kids: The American Dream in Crisis*, on the growing class gap among American young people, was published in March 2015.

About the Reviewers

Steve Hornstein received his undergraduate degree in Elementary Education and his doctorate in Teacher Education from the University of North Dakota. He has worked as a pre-school teacher, a kindergarten teacher, and elementary and middle school teacher and an elementary school principal. He has worked as a professor of Elementary Education at St Cloud State University since 1987. Steve has also been involved with progressive education for nearly 40 years. He taught in open schools, served as the President of Whole Language Umbrella, and has worked with NGO's and the Bureau of Indian Education on literacy projects in West Africa and the American Southwest.

John Hoover received undergraduate degrees in elementary education and psychology at St. Cloud state University in 1978, where he now serves as a professor of Special Education and as the Research and Program Assessment & Evaluation Coordinator for a teacher improvement grant from the Bush Foundation. Hoover's doctorate was awarded by Southern Illinois University, Carbondale. Hoover's research interests are in program assessment, bullying prevention, and cognitive approaches to curriculum. He has taught at several universities other than SCSU, including Murray State, the University of South Dakota, the University of North Dakota, and the University of Winnipeg.

Book Review (2):

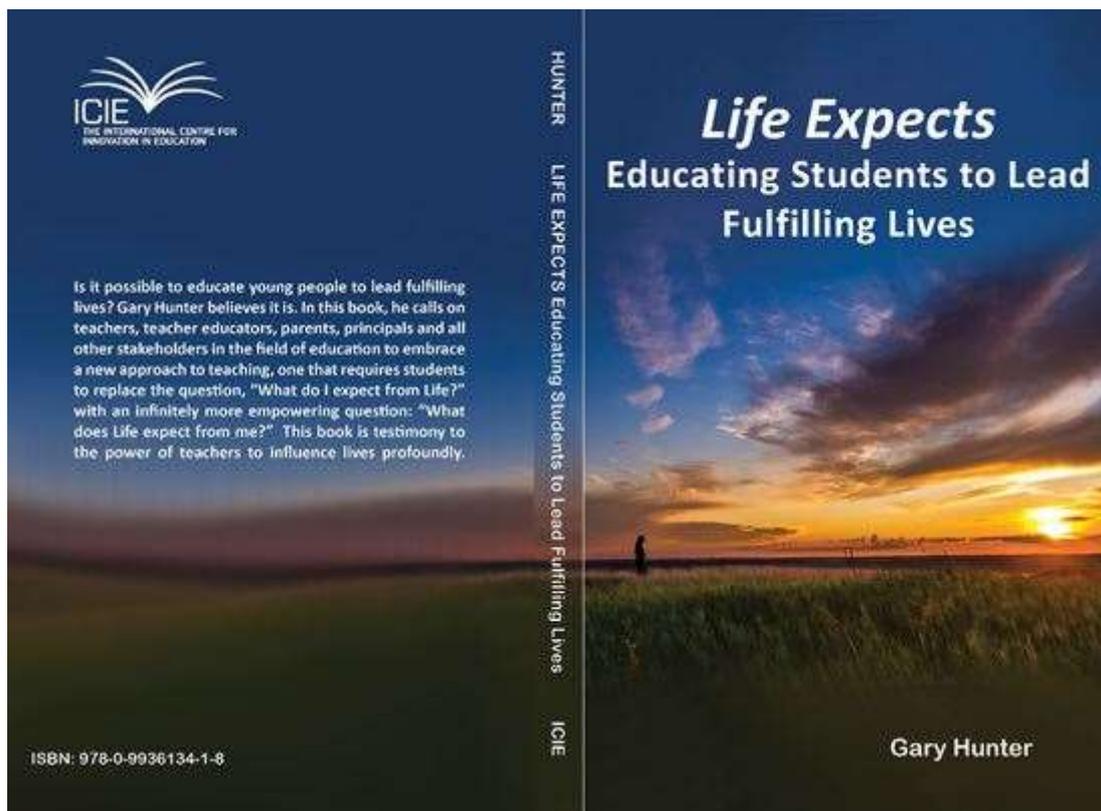
Life Expects: Educating Students to Lead Fulfilling Lives

Gary Hunter (2015)

Sandra K. Linke

The International Centre for Innovation in Education (ICIE), Ulm-Germany

Life Expects: Educating Students to Lead Fulfilling Lives by Gary Hunter is a stimulating, informative, provocative, and well-referenced book that focuses on unleashing human energies, passions, and talents. Hunter's paradigm Life Expects has its primary inspiration and conceptual roots in the work of Victor Frankl who recounted in *Search for Meaning* how prisoners in the concentration camps lost their will to live because they felt there was no longer anything worth living for, nothing left to expect from life. Frankl surmised there was a need to teach the despairing individuals that it did not really matter what they expected from life, but rather what life expected from them.



Is it possible to educate young people to lead fulfilling lives? Gary Hunter believes it is. In this book, he calls on teachers, teacher educators, parents, principals and all other stakeholders in the field of education to embrace a new approach to teaching, one that requires students to replace the question, “What do I expect from Life?” with an infinitely more empowering question: “What does Life expect from me?” This book is testimony to the power of teachers to influence lives profoundly.

Hunter's Life Expects paradigm calls for individuals to believe and act on the conviction that we are called by life from within by inner voices, to certain destinies, and that we answer this call by discovering and rendering our unique gifts to the world. He contrasts the Life Expects paradigm with the I Expect paradigm. Hunter builds a strong case for the dominance of the I Expect paradigm in today's world with our obsession with individualism and an emphasis on personal rights and freedoms. As people emphasize individualism and self-centeredness, Hunter points out that many people in striving for self-fulfillment have become less concerned with others. He uses a quotation from the Canadian philosopher, theologian, and humanitarian Jean Vanier to support the Life Expects paradigm:

Each of us has an instrument to bring to the vast orchestra of humanity, and each of us needs help to become all that we can be.

Hunter is a realist and recognizes there are numerous challenges and demands made on teachers who endeavor to implement the Life Expects paradigm in their teaching. He predicts teachers will experience resistance from students, parents and colleagues, and he shares "stories" from his own experiences in introducing the Life Expects Paradigm at the University of Manitoba. The infusion of "stories" is one of the prime assets of this book. There are stories from Hunter's wide educational experiences and that of numerous exemplars who lead lives that Life Expects one to lead. To withstand resistance to the implementation of the Life Expects paradigm, Hunter suggests that teachers need to be compassionate, patient, and steadfast.

In Chapter Three, there is a discussion of what really matters in life and education, and ways to resist living lives of quiet desperation as described by the American writer Henry David Thoreau. Hunter discusses how our inner voices can be hijacked by outer voices that help to destroy our authentic selves, and the importance of teachers inspiring students to lead the lives Life Expects them to live. A strong conviction that teachers can make or break students is introduced in this chapter, and the term "tapping" is used to describe how teachers can tap into their students' personal fascinations to discover their unique gifts, and provide opportunities for them to render their gifts. Great examples of teachers who do just that are provided including Elliott Wigginton and his Foxfire experiences.

Chapter Four identifies the characteristics teachers need to have to engage students in a Life Expects classroom. Life Expects teachers are described as idealist; they are authentic, self-determining, generous, and able to nurture the hearts of troubled students. Multiple authors and examples of teachers who model these characteristics are woven throughout this chapter.

Chapter Five discusses meeting the critical student learning needs in the Life Expects curriculum. These needs include: Safety, belonging, and confidence-affiliated learning needs (feeling responsible, successful and affirmed). This chapter is replete with examples of educators who increased the independence and self-direction of their students, and tapped their unique gifts. Chapter Six introduces the concept of deeper level teaching rather than surface level teaching.

The key to deep teaching according to Hunter is few, significant, and thorough. By saving time with deep teaching, teachers can then ask students to identify defining moments in their life in which they discovered their calling; engage students directly in their fields of study; impress upon them the value of solitary reflection; and provide experiential learning.

Chapter Seven provides an introduction to the habits of character for the Life Expects paradigm. Hunter stresses that attitude precedes habit, that habits of character are behavioral and observable, and habits can be introduced at every grade level. Steven Covey's definition of habit as the intersection of knowledge, desire, and skill is used by Hunter to identify four habits in the Life Expects paradigm. Habit #1- Having the Courage to Be is discussed in Chapter Eight; Habit #2- Valuing Process over Outcome is discussed in Chapter Nine; Habit #3- Aspiring to Measure Up is discussed in Chapter Ten; and Habit #4- Having an Abundance Mentality is discussed in Chapter Eleven.

In Hunter's Final Thoughts, he reiterates his belief that we are in this world by invitation and that in return for the privilege of being here, we are expected to contribute to making it a better place, and in this process lead fulfilling lives. *Life Expects: Educating Students to Live Fulfilling Lives* provides invaluable reading for those engaged in initial teacher training and professional development, plus all points in between. It is an exceptional "read" with a wide collection of authors, thought-provoking quotations, and practical application activities to invigorate the thinking of the reader, and points the way for teachers, parents and significant others to educate students to lead fulfilling lives. In addition, individuals who embrace the Life Expects paradigm will be empowered to lead fulfilling lives as they model the behavior and habits suggested in this *jewel* of a book.

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About the Author

Gary Hunter is a specialist in the areas of instructor training, oral presentations, facilitative leadership and interpersonal communication skills. For the past thirty years he has delivered hundreds of courses and workshops in these areas to a wide variety of corporate, government, university and adult education institutions. Gary also spent seventeen years teaching in a teacher education program at the University of Winnipeg where he specialized in classroom instruction, motivation and management.

About the Reviewer

Sandra Linke is a specialist in gifted education. She has a B.A. and M.A. in Gifted Education, and a Ph.D. in Creativity. She has developed a dynamic model to represent the conception of creativity. She has published a book and a number of articles. She has conducted a number of workshops in different countries, including: Germany, France, Austria, Kuwait, United Arab Emirates, Turkey, and Jordan. She is an active member of an impressive list of academic institutions including: the British Educational Research Association (BERA), the European Council for High Ability (ECHA), and the World Council for Gifted and Talented Children (WCGTC). In 2006 she was elected as a member of the editorial board of the Gifted and Talented International. In addition, she has established, in cooperation with Taisir Yamin and Todd Lubart, the International Centre for Innovation in Education (ICIE-Paris).

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Book Review (3):

Out of Sync: Essays on Giftedness

Stephanie S. Tolan (2016)

Dorothy A. Sisk

Lamar University, USA

In the book *Out of Sync*, Stephanie Tolan generously shares her personal and experiential journey to viewing the needs of the highly gifted from a whole child perspective including their spiritual needs. The journey was motivated by the pain of her son RJ and her best friend's son Jason, both highly gifted children who experienced inappropriate curriculum, and even refusals to acknowledge or meet their needs. Stephanie describes the two young children as *out of sync* with the norms of the American educational system.

The sixteen articles and chapters written over a 30 year period in *Out of Sync* represent Tolan's learning and thinking, becoming both an advocate and expert on the needs of individuals at the right end of the bell curve. The sixteen essays and talks are represented in the following journals and newsletters: *OAGC Review*, *Gifted Child Today*, *Highly Gifted Children*, *TIP Network News*, *Roepers Review*, *Gifted Education Communicator*, *Advanced Development Journal* and in chapters in two books, *Organic Creativity in the Classroom: Teaching to Intuition in Academics and the Arts* edited by Jane Piirto and the *Young Gifted Child: Potential and Promise: An Anthology*, edited by Joan Smutny.

The first article in *Out of Sync* is *An Open Letter* that Stephanie Tolan wrote for her son's teachers. In the letter, she makes a strong case for why parents of highly gifted children need help.

When you consider the strains a parent must deal with, then add the complications encountered when the child is not only gifted but temperamentally difficult, it is possible to understand why some parents appear not to deal very well with their very bright children, and why the parents need special help. (p. 15)

Highly gifted children respond to school in different ways. Some may withdraw, rebel or become disruptive, and Tolan says there is real damage to their attitudes, learning patterns and abilities. She points out that the highly gifted child learns in ways that are very different from the ways schools teach. Tolan cautions parents to be careful to avoid schools whose procedures and patterns are too rigid to allow for the highly gifted child's differences, and their need to explore. Tolan shared that one of the most successful educational experiences for RJ and Jason was the Duke Talent Identification (TIP) Summer Program. The *Open Letter* is a free and honest sharing of Stephanie's journey with her son and Jason. She closes the letter by saying that off-the-chart kids are "the least regarded, least served, and possibly the most misunderstood population of all. (p.30)



Is it a Cheetah

The second article *Is It a Cheetah* was widely distributed throughout the U.S. and translated into more than 40 different languages. The cheetah metaphor helps us to think about the problem with **achievement-oriented thinking**. Stephanie addresses the emphasis on talent and the dismissal of the term giftedness. She says, "It appears that intellectual talent is more and more perceived as synonymous with academic achievement. When we think of cheetahs, we think first of their speed, and who does well in school, gets good grades, wins awards and performs beyond the norms for his or her age is considered talented." (p. 32). She points out:

A school system that defines giftedness or talent, as behavior, achievement, and performance is as compromised in its ability to recognize its highly gifted students and to give them what they need, as a zoo would be to recognize and provide for its cheetahs if it looked only for speed. (p. 34)

Tolan notes that schools are to extraordinarily intelligent children what zoos are to cheetahs, and both cheetahs and highly gifted students sit dull-eyed and silent in cages and in schools that do not provide challenge for the development of their extraordinary needs. This article is thought provoking and represents a cogent argument to help educators understand and commit to the need to design programs for gifted students, particularly the highly gifted students.

Stuck in another dimension

In the article *Stuck in Another Dimension: The Exceptionally Gifted Child in School*, Stephanie Tolan aptly states, "It's important for parents and exceptionally gifted children alike to understand that educators do not misunderstand on purpose. What is normal for us is simply not believable to them; it's as if we are living in another dimension, trying to explain our world. (p. 42).

Tolan identifies obstacles that highly gifted children and youth face and the most obvious problem is created by the age/grade lockstep system. She reminds us that the exceptionally gifted child typically learns by total immersion, dislikes repetition and drill and values process over product. She says:

Unless they can also experience excitement, thought-provoking complexity, and interesting difficulty, they can be overwhelmed by the boredom. They will lose interest in both product and process." (p. 49)

Stephanie uses the astronauts as an analogy with highly gifted students, and she said we wouldn't send astronauts naked to the moon, we protect them with space and oxygen and, "It is high time we provide protection and sustenance for our finest minds." (p.51) Tolan ends this article with the need to provide educators with maps and guidebooks of the highly gifted students' world, so they can begin, with a degree of confidence to let go of the rules that they have been taught to follow. She is asking educators to make adaptations based on the characteristics and unique needs of highly gifted children...."to take the artificial limits off our children's minds."(P.51)

Beginning brilliance

Beginning Brilliance represents a rich and comprehensive chapter in Joan Smutny's book *The Young Gifted Child: Potential and Promise. An Anthology*. Stephanie focuses on highly to profoundly gifted students and the importance of their giftedness being recognized in their early years. She points out that the term *gifted* is becoming more and more politically incorrect with more emphasis on academic achievement as the sole determinant of giftedness. She shares the Columbus Group's definition of giftedness:

Giftedness is asynchronous development in which advanced cognitive abilities and heightened intensity combine to create inner experiences and awareness that are qualitatively different from the norm. This asynchrony increases with higher intellectual capacity. The uniqueness of the gifted renders them particularly vulnerable and requires modifications in parenting, teaching and counseling in order for them to develop optimally. (p. 65)

Tolan states that within the gifted range there is a far larger span of cognitive difference than there is between normal and gifted. One concern that she aptly identifies is the use of the revised Stanford-Binet and Wechsler tests to identify gifted students and that these tests virtually eliminate the high scores that could act as identifiers of profoundly gifted students. Dabrowski's OE (Overexcitability) theory is discussed as it relates to giftedness and that the intellectual OEs of a child may cause them to be identified, and the emotional OEs account for their sensitivity and compassion. From Dabrowski's perspective, expanded awareness and emotional intensity are viewed as "assets" that can enrich and empower rather than liabilities that could erode talent.

Tolan identifies acceleration as a way to provide for highly gifted students. She suggests that if schools do not allow acceleration, that the use of a mentor willing to meet and share expertise with highly gifted students is one way to meet their need for intellectual challenge and stimulation. In addition, homeschooling is now legal and this may be a possibility for educating the profoundly gifted. Yet homeschooling can be demanding and some highly gifted students want and need the companionship of other children. Tolan reminds us that if these children of great promise are to realize a strong sense of self and fulfill their promise, it will largely depend on the adults in their world to advocate for them.

Sex and the highly gifted adolescent

In the article *Sex and the Highly Gifted Adolescent* Stephanie Tolan provides two stories of gifted adolescents dealing with their sexuality. She discusses the way they cope, their psychological tools and wounds, and the mental processing they use. Tolan stresses the fact that most highly gifted children have felt isolated from others in their childhood and consequently have a special need for belonging. The identification of self as homosexual is discussed, and she stresses this subject should not be ignored. Tolan highlights the complex internal reality of the highly gifted adolescent and points out that the often painful external pressures that impact other aspects of their lives, also impact their emerging sexuality. This is a subject rarely discussed in gifted circles, and in this article Tolan presents thoughtful points of information on the sexuality of highly gifted adolescents that can be addressed by educators and parents.

Spirituality and the highly gifted adolescent

Spirituality and the Highly Gifted Adolescent is a much neglected topic in gifted education, and only recently has there been much interest in education of the spiritual needs of gifted students. Most parents of highly gifted students know their children early on ponder spiritual questions such as: Why am I here? Tolan aptly addresses the conflict that many educators have with religion and spirituality.

Tolan points out the importance of role models either parents or other significant adults who can model the importance of seeking a life of purpose and meaning, and offer thoughtful answers to the questions of highly gifted children. Robert Coles' stages of a spiritual pilgrimage are discussed and examples of individuals who engaged in spiritual pilgrimages are highlighted, including Peace Pilgrim who dedicated her life to "walking for peace." The work of Dabrowski is used to illustrate the unusual potential for moral reasoning that gifted individuals possess. In addition, David Feldman's work with past-life memories of prodigies and the work of Atwater with children who have had near death experiences are covered. Tolan shares her own theory that highly and profoundly gifted children exhibit not only unusual cognitive abilities, but unusual intuitive non-rational abilities as well (p. 98). This article addresses one of the more important questions educators and parents need to consider: How to assist highly gifted students to develop a firm hold on their spirituality with a sense of personal mission, purpose and meaning.

Giftedness as asynchronous development

In this article *Giftedness as Asynchronous Development*, Tolan shares the work of the Columbus Group in creating a new way of looking at the internal phenomenon of giftedness as asynchronous development. Tolan, one of the founding members of the Group developed a definition

of giftedness. Asynchronous development involves advanced cognitive abilities and heightened intensity; these combine to create inner experiences and awareness that are qualitatively different from the norm. This article emphasizes that the young gifted child may appear to be many ages at once. He or she may be riding a bicycle at 8, 12 when playing chess, 15 when studying algebra, 10 when collecting fossils, and two when asked to share his chocolate chip cookie with his sister (p. 102). This article emphasizes the need to understand giftedness as a stable aspect of the self, and the issue of differential development will help educators and parents not only understand but support the whole gifted child, rather than only her accomplishments.

The lemming condition

The article *The Lemming Condition: Moral Asynchrony and the Isolated Self* deals with the deep difference of highly gifted students, their inner awareness, and as a result of their asynchronous development, highly gifted children are automatically more moral than other children. Tolan uses Alan Arkin's children's book *The Lemming Condition* as a powerful metaphor for the place of the morally asynchronous gifted child in human culture (p. 105). She recommends highly gifted students encounter the stories of people like Peace Pilgrim, Gandhi, and Mother Theresa who found ways to succeed in growing up, in living with integrity, defying the lemming condition and molding their behavior to their deepest beliefs.

Tolan says one way we can help asynchronous children trust and believe in themselves is by showing them that we believe in the importance of all their unique gifts, their hearts as well as their heads, and help them find a balance. We need to help asynchronous students early on to begin their spiritual journey and Tolan wisely states, "...the farther they are likely to go, the more humanity itself is likely to change in the process." (p. 110)

The problem of pain

In the article *The Problem of Pain*, Tolan says, "Life for highly gifted children and their families can be enormously difficult, and the parents who call her are dealing with pain--often intense pain--their children's and their own." (p. 121). She says that extreme giftedness in a family can create a level of pain equal to that of dealing with a severe handicap. This article includes ten tools called the "Nifty Tool Kit". At the end of the nifty tool kit, there is what Tolan calls the Swiss army knife of tools--*perspective*. She says everything in our life view depends on perspective. Tolan wisely points out that changing our perspective and changing ourselves is a choice. She says whatever the life situation, whatever the pain, each of us, child or adult, always has that choice. This is a sensitive and compassionate article dealing with a very important issue in gifted education, the pain endured by asynchronous students and their parents.

In praise of pollyanna

In the article *Praise of Pollyanna*, Tolan discusses the power of a positive outlook to change perspective on a difficult situation and eventually to change the situation. She says she spent most of her lifetime as a pessimist, and only in recent years has she been called a *Pollyanna*. Tolan suggests parents and educators find a copy of Eleanor Porter's book *Pollyanna* and try the *glad game*. The glad game can help not just gifted families dealing with the lack of appropriate educational opportunities, but nearly all of us trying to keep our balance in unsettled and difficult times. "(p. 139) Pollyanna's father taught her the *glad game*, in which no matter what happens to you, you hunt for the glad things, and you sort of forget the other kind.

Mental activity and the feeling of well-being can be supported by a positive outlook. Tolan discusses Viktor Frankl, who said, "He who has a *why* to live can bear with almost any how" The glad game does not deny pain and difficulty, it simply challenges you to find a way to look beyond them. Tolan says, "A child who when the educational system fails her, greets that failure with resilience, courage, and a cheerful reliance on her own internal resources is unlikely to be damaged beyond repair. (p. 146)

Self-knowledge, self-esteem and the gifted adult

This article *Self-Knowledge, Self-Esteem and the Gifted Adult* discusses the cultural patterns affecting the gifted adult's sense of self, sense of self-worth and feelings of belonging. Many successful achieving adults have found, fame, fortune and eminence that our culture expects from the highly intelligent; yet, these individuals may not have been formally identified as gifted. Consequently, they may disbelieve the identification or have difficulty incorporating the giftedness concept into their sense of self. The *Impostor syndrome* can lurk in their minds.

Tolan (2016) says the higher the IQ or the greater the intellectual capacity, the more individual differences there will be between individuals. She suggests that if we were to think of these various unusual mental capacities as "dots" and the lack of them as "spaces", we would see that each highly gifted individual is likely to feel different from other highly gifted individuals, and this sense of difference is likely to create a sense of inequality." (p. 149). If an individual focuses heavily on the "spaces" he or she may feel incompetent rather than unusually able. Tolan says looking at giftedness from the "dots and spaces" perspective may not instantly convince a gifted adult that he or she is gifted or solve their self-esteem problems of a lifetime, but that perspective can give one a new way of looking at self. She says, "Learning to celebrate our own constellation of "dots" can begin a process of self-understanding that can lead to real and positive changes in gifted lives." (p. 152)

Discovering the gifted ex-child

Tolan in the article *Discovering the Gifted Ex-Child* discusses her failure to recognize her own giftedness, and how it suddenly made sense of the intensity with which she defended her son's right to have his needs recognized and met, as her needs had not been met (p. 151) She poses the question: Does the gifted child grown up, become an ex-gifted child? She explores the concept of giftedness and says if it is a *quality of mind* and a stable attribute, it will remain with the individual throughout life, whether outwardly evident or not.

Tolan discusses the use of IQ tests to assess a child's innate capacity to reason and learn, and how the test results can be useful in locating children whose extraordinary potential requires unusual educational methods. However, in examining adults, the focus changes, for gifted adults are the people who achieve spectacularly. This changing definition of giftedness from childhood to adulthood can make it appear that of the many identified gifted children, that only a few have gone on to become gifted adults. Tolan shares a response to Terman from a participant in his classic study of gifted children and adults who said:

You assess youngsters on the basis of learning ability and personality but you assess adults by a more worldly measure of financial standing and recognition by a public which has never shown any great ability in distinguishing between knaves and fools and good public servants." (P. 157)

Tolan suggests that we could refer to *differentiated development* since the direction gifted adults choose for their continued growth is likely to be idiosyncratic. An achievement-based measure of giftedness devalues the individual and sets the scene for more children who may not be able to fit their mental gifts to the schools narrow range of achievement. They enter adulthood unaware of or denying the needs of their unusual minds. Tolan says gifted children don't disappear when they graduate from high school or finish college or graduate school, they become gifted adults.

You can't do it wrong

In this thoughtful and provocative article *You Can't Do it Wrong* Tolan says what really matters is that parents care about their children and wish to do the best job they can of raising them. She emphasizes that parents of highly gifted students are asked to deal on a daily basis with someone who has abilities many other people believe to be impossible. She says if parents were to believe, or even act as if every single choice they made for their child was the right choice at the time it was made, one of the heaviest burden parents carry in raising their children would be removed (p.172). If something a parent decides to do for their children doesn't turn out well--is a mistake--then the parent

can model for their child a way of handling mistakes that proves that mistakes aren't failures, but learning experiences. (p. 173) Tolan steadfastly states parents need to keep their perspective on the joys that gifted children bring and be grateful for those, and that will help you act as if, or even actually believe that you can't do it wrong. She wisely says "In the long run, your child has a journey that is his or hers alone, and what he or she does with it, what path he or she chooses, will create a life that in no case is under your control." (p. 173)

Imagination to intuition

The article *Imagination to Intuition: The Journey of a Rationalist into Realms of Magic and Spirit* represents a personal journey of Stephanie Tolan, who likens her experience with a psychic, like Alice looking through the looking glass. Tolan found she did indeed have a psychic bone in her body. She shares her childhood pretend world and imaginary friend *TeeDee*, and how as an adult writer she is able to maintain her childhood imagination. Tolan discusses the magic of writing, and her exploration of the farther reaches of human consciousness.

Stephanie shares some of the strategies she uses to develop characters in her novels, notably in *Welcome to the Art* with characters who have what seems to be impossible rational capacities of mind, and impossible non-rational abilities as well. She says her thoughts when she is writing seem not to be coming from her own normal mental process, but represent thoughts that feel just the way writing often does, as if the thoughts are coming to her rather than originating with her (p. 181). This article is a very open and personal journey of Tolan finding connections. She weaves points of view of physicists and psychics as they explore consciousness and the foundation of the universe to stimulate our thinking about imagination and intuition which can take us into both magic and spirit.

The magic of writing

The article *The Magic of Writing* is specifically written for teachers of gifted children who need to have their creativity and imagination supported. Tolan begins the article with the statement that schools are to creativity as zoos are to wildness, and just as the nature of zoos curbs much of the wildness of its inhabitants, the nature of schools curbs creativity. At age four, she taught herself to read with the help of comic books, and says it was liberating to enter the world of the story on her own, but with a sense of loss, for the black marks themselves could never again be magical and mysterious. (p.196)

Tolan describes *robust creators* who persistently refuse to follow directions, insist on doing things their own way, and are willing to accept standing out from the crowd however painful that may sometimes be and however harmful it can be to their grade point average. Stephanie says she was a *robust creator* who went underground early, and found a place for herself in the fourth grade. Her teacher asked the class to write a story and Stephanie wrote her story from the point of view of a pineapple. She still has that story with its imperfect spelling and copied over "in ink."

More than six decades after that first story, Tolan is still writing. The words on the page allow other people to share the world that grew in her imagination as it comes to life in theirs. She suggests ways to encourage creativity and to support imagination such as reading stories and books aloud, using visualization exercises, and sharing your own creative impulses and interests with your students. She lists things that stifle creativity including criticism, both positive and negative, fear, and too much sitting down and shutting up. She closes the article with a statement of what kids need from the adults in their world-- not perfection, but a willingness to see them for the individuals they are and at least to try to make a place for them in a system that was not designed for differences. (p 208)

Change your story, change your life: Putting story principle to work

In this last article of the book *Out of Sync* Tolan shares how the stories we all tell one another about what is happening to us, what has happened, what is likely to happen next, and what it all

means don't feel like stories, they feel like reality. Yet, Tolan says *story telling* is the stories we tell our self about our experiences, and she wondered if the stories we tell our self about our lives could be changed in the same way she changes a story she is writing? if the story begins to go in a direction she doesn't like, she simply highlights, deletes and then writes something else. We create our own reality and whatever we pay attention to increases--*intention* can affect material reality. She says setting an intention or in my terms, telling a new story steadily, with purpose and dedication--might actually bring that new story alive, not just in one's mind, but in experience (p. 214). She tried it herself in small, unimportant ways at first, and it began to work.

Tolan describes a toggle switch in our head, one side labeled positive, and the other negative, and one can throw that switch to the positive side and tell and believe in more positive stories. She calls expressing the new/old idea that consciousness creates experience *Story Principle*. *Story Principle* doesn't take conflict out of our lives, it gives us tools for coping--methods of moving through conflicts. (p. 224). Tolan courageously says we are the heroes of our own story, but we are also in part, its author. *Story principle* gives us the power of choice.

Reference

Tolan, S.S. (2016). *Out of sync: Essays on giftedness*. Unionville NY, USA: Royal Fireworks Press.
ISBN: 978-0-088092-499-3

About the Author

Stephanie S. Tolan has written and published poetry, plays, and more than two dozen books for children and young adults, including the 2003 Newbery Honor-winning *Surviving the Applewhites*. She began to write nonfiction about the needs of highly to profoundly gifted children after the discovery that her son and the son of her closest friend were seriously out of sync with the norms of the American educational system. Co-author of the award-winning *Guiding the Gifted Child* (1982), she has gone on to write and speak about the needs of the gifted ever since. Her novel *Welcome to the Ark*, about four profoundly gifted children who meet in a mental institution, has given many out-of-sync children the comfort of finding themselves in a work of fiction.

One of the original members of the Columbus Group, Tolan helped bring the concept of asynchronous development to the gifted community and co-edited *Off the Charts: Asynchrony an the Gifted Child*. A Senior Fellow at the Institute for Educational Advancement, she participated in designing Yunasa, a summer camp experience for highly gifted children that focuses on helping them balance mind, body, spirit, emotions, and social self.

About the Reviewer

Dorothy A. Sisk, Ph.D. is a professor at Lamar University in Beaumont, Texas, director of the Gifted Child Center. She is an international consultant focusing on leadership/ creativity development, and former director of the U. S. Office of Gifted and Talented. Dr. Sisk was a founder and first President of the American Creativity Association, and founder/ President of the World Council for Gifted and Talented Children, serving as executive administrator, and editor of Gifted International (1980-1990). She is author and co-author of 13 books and numerous articles.

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Conference Highlights:

The 13th International Conference on: “Excellence, Innovation & Creativity in Basic-Higher Education & Psychology” Rijeka, Croatia (May 18-21, 2016)

Alan C. Wiebe

The University of Winnipeg, Manitoba, Canada



www.icieconference.net

It was a pleasure for me to have participated in the annual International Centre for Innovation in Education (ICIE) conference at the University of Rijeka in Rijeka, Croatia this past May, 2016. I was honored to have been invited to deliver a keynote address outlining the work being done at the University of Winnipeg in Winnipeg, Manitoba, Canada. It was also a privilege to be part of a breakout session with my colleagues from the university on the variety of innovative programming that exists in our institution. I was also humbled to have been chosen to be the recipient of the ICIE Program Development Award in recognition of contributions in the areas of Mentoring and Community Outreach. It is a pleasure for me to provide this brief description of the content of the conference for the “International Journal for Talent Development and Creativity.”



It was my first visit to the lovely country of Croatia with its beautiful topography and landscapes. Our University of Winnipeg contingent took a two hour ride from Zagreb Airport west to the lovely small city of Rijeka on the Adriatic Sea. We registered in a very comfortable hotel in the downtown of the city. The first day was a short walk to the convention centre for the opening ceremonies which included entertainment and introduction

of the youth that were part of the Youth Summit at the conference. The planning was excellent and the venue comfortable and adorned with a very savory Croatian luncheon.

Besides the welcome reception Day One of the conference included 5 keynote addresses by internationally renowned educators and academics. Keynotes included Ken McCluskey, Dean of Education from the University of Winnipeg in Winnipeg, Manitoba, Canada, Joseph Renzulli, Director of the Neag Center for Creativity, Gifted Education, and Talent Development (Storrs, Connecticut); Sally Reis, Vice Provost of Academic Affairs and a Board of Trustees Distinguished Professor at the University of Connecticut, U.S.A., Pero Lucin, The Rector, University of Rijeka and Todd Lubart, the Director of LATI, Universite Paris Descartes, Paris, France.



Joseph Renzulli, renowned academic in the realm of talent development, excited the audience with his presentation on “Schools for Talent Development: A Comprehensive Plan for Program Planning and Implementation”. His presentation provided an overview of a talent development model that is based on over thirty years of research and development that is being used in schools in the U.S. and other nations around the world.

Sally Reis went on to speak on a timely issue entitled “The Underachievement Dilemma & Gifted Girls & Women”. The content of her keynote highlighted the frustration of parents and teachers with the underachievement of their gifted daughters, as well as gifted students in general. Suggestions for reversing this underachievement was discussed which begins with identifying that the issue exists.

The afternoon of the first day culminated with an enlightening video interview with the Nobel Laureate Roald Hoffmann from Cornell University in Ithaca, U.S.A. The interview was conducted by Taisir Subhi Yamin, Director of the International Centre for Innovation in Education. This discussion was an illuminating description of Roald’s life under the title, “My Life Journey, Creativity, Innovation, and Excellence in Science & Education.”

The conference moved to the University of Rijeka for the balance of the sessions. Notable keynote addresses on day two were from the Director of the Center for Practice and Research on Gifted Education at Anadolu University in Turkey, Ugur Sak, Jacques Gregoire from the School of Psychology and Educational Sciences, at Catholic University of Louvain in Belgium, Don Ambrose (by Video & Skype) from Rider University in New Jersey, U.S.A. and Boris Jokic of the Centre for Educational Research and Development at the Institute for Social Research in Zagreb-Croatia.



Don Ambrose was unable to attend the conference but was able to connect up through Skype to share his presentation, entitled “Creative Intelligence in the 21st Century: Grappling with Enormous Problems and Huge Opportunities.”_His keynote described the result of a large-scale, collaborative project involving leading scholars of creativity and giftedness in discussions of the ideal nature of education in the challenging global 21st century. Don made suggestions about the blend of knowledge, skills, and dispositions required for dealing with macro-problems and capitalizing on the macro-opportunities.



The origins of the featured addresses on Day three and four once again showcased the large international and educational diversity of the 7 speakers. Svjetlana Kolic-Vehovec from the University of Rijeka in Croatia, Alan C. Wiebe of the Faculty of Education at the University of Winnipeg in Winnipeg, Manitoba Canada, Heinz Neber from ICIE in Ulm, Germany, Jasminka Ledic of the Department of Education at the Faculty of Humanities and Social Sciences, the University of Rijeka, Mojca Jurisevic of the Faculty of Education at the University of Ljubljana, Slovenia, Kristof Kovacs from the Eszterhazy Karoly College in Hungary and Anies Al-Hroub of the Department of Education at the American University of Beirut (AUB), Beirut, Lebanon.

Svjetlana Kolic-Vehovec, from the University of Rijeka, spoke to the conference audience about metacognition and motivation in a keynote entitled, “Combination for Success: Metacognition and Motivation.” In her address Svetlana outlines that metacognition is an important determinant of effective problem solving, and that high level metacognition is related to high ability or giftedness.



On the final day Ken McCluskey, Philip Baker, Joseph Goulet and I joined Taisir Subhi Yamin in an interactive discussion of innovative programming currently underway within the Faculty of Education at the University of Winnipeg. Three themes were presented. The first was a description of the popular Post Baccalaureate Program, which provides coursework for practicing educators in areas such as Counseling, At Risk Youth, and Sustainability. Access Education was highlighted due to its importance for our Indigenous populations as well as Immigrants and Newcomers to Canada. The final theme shared information on the effective use of Mentoring as an intervention for working with youth considered at risk of disengaging from their education.

No conference is complete until you hear from the youth that are in attendance. The spirited youth summit capped the conference with a well-orchestrated finale to a successful gathering of some 450 educators, academics and students from different parts of the globe. The gathering was the energetic culmination to the annual International Centre for Innovation in Education conference. The organization continues to broaden the scope of educational innovation in a world that is on the cusp of so many changes.

About the Author

Alan C. Wiebe is currently the Community Outreach Mentorship Coordinator at the University of Winnipeg. He has worked in many capacities helping to develop programming for “at-risk” youth in Manitoba, Canada, and served in the public school system as a regular classroom teacher, alternative program director, and counsellor. Alan, who teaches courses such as Education Today, Issues with At-Risk Children and Youth, and Mentoring At-Risk Youth, has done many presentations on the international stage (including major sessions in Rijeka, Croatia, Jerusalem, Nairobi, and Ulm, Germany). He has written and co-edited articles, chapters, and books emphasizing the power of reaching out to vulnerable populations through mentorship, and is lead author of a recent publication entitled *Connecting with At-Risk Children and Youth through Mentoring: Ten Elements to Consider*. He is also one of the authors of the recently published book entitled *Lost Prizes – Identifying and Developing the Talents of Marginalized Populations*. He will also be lead author of the forthcoming text, *Mentoring for Talent Development in the North American Context*.

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The 14th International Conference on: Excellence, Creativity & Innovation, Gifted Education Dubai – United Arab Emirates (December 9-10, 2016)

The 14th ICIE conference will take place in Dubai (December 9-10, 2016). The conference organized by the International Centre for Innovation in Education (ICIE) in partnership with GEMS World Academy-Dubai, and California Learning Center (CLC).

Besides the welcome reception Day One of the conference included 14 keynote addresses by internationally renowned educators and academics. Keynotes included Joseph S. Renzulli; Don Ambrose; Peter Csermely; Maija Aksela; Heinz Neber; Taisir Subhi Yamin; Todd Lubart; Arthur Gogatz; Anies Al-Hroub; Suha Jouaneh Shahin; Andrew Willmoth; Klaus-Peter Eichler; Sandra Krpan; and Nana Gulic).

In addition, the conference offered 18 workshops; 2 symposia, and introduced a special session about developing the ICIE summit for the gifted and creative youth (Sandra Krpan; Nana Miladinovic Gulic). ICIE Publications and conference materials were distributed during the conference.



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Lost Prizes/ICIE Seminars July 12 – 15, 2017

Kari McCluskey

The University of Winnipeg, Manitoba, Canada

Lost Prizes International (LPI) and the International Centre for Innovation in Education (ICIE) are working hard once again in preparation for the 5th Annual Lost Prizes/ICIE Seminars taking place July 12-15, 2017 at The University of Winnipeg. This year marks a unique occasion as not only are we celebrating a milestone anniversary, it is also the culmination of a three year national research project focused on bridging gaps in education and settlement services. The research has identified both challenges and best practices and continues to work to develop teacher training and student supports. The project is led by The University of Winnipeg's Jan Stewart. This year's seminars, with the theme of *It Takes a Village*, will offer training and presentations addressing some of the needs revealed by students, teachers, families, and settlement workers throughout this research. Further curriculum and classroom supports are expected to be published in the coming months.

Conference-connected Post-Baccalaureate Diploma in Education courses will be offered before and after the conference. These courses include: *Poverty and Potential*, *Teacher Stories*, *Student Stories: Educating with Purpose*, *Borrowing Indigenous Perspectives: An Inclusive Approach to Safe and Healthy School Communities*, *Strategies to Support Trauma Affected Learners*, *Emotional Intelligence and Educational Leadership: Creative Approaches to Teaching and Learning*, and *Expanding Gifted Education*.

Featured keynote presentations include:

Memoirs of a Boy Soldier

Ishmael Beah

Ishmael Beah, born in Sierra Leone, West Africa, is the New York Times best-selling author of *A Long Way Gone*, *Memoirs of a Boy Soldier* and *Radiance of Tomorrow*, A Novel both published by Farrar Straus & Giroux.



His Memoir has been published in over 40 languages and was nominated for a Quill Award in the Best Debut Author category for 2007. TIME Magazine named the book as one of the "Top 10 Nonfiction books of 2007," ranking at number 3. His novel written with the gentle lyricism of a dream and the moral clarity of a fable is a powerful book about preserving what means the most to us, even in uncertain times. Already available in several foreign languages, the New York Times finds in his writing an "allegorical richness" and a "remarkable humanity to his [Beah's] characters".

Trauma and Learning: Supporting Students who Carry Trauma

Carl Heaman-Warne

Traumatic experiences can affect all aspects of our lives, and alter the processes of engagement, memory, and learning. Whether our youth are living in fearful or abusive environments,

survivors of violence or neglect, or coping with significant loss; these experiences change who they are and what they take in. Understanding these impacts is key to creating environments conducive to learning for students who carry trauma. This keynote will offer an understanding of trauma; focusing on the impacts of this experience while helping educators and service providers make sense of the behaviours they see in the classroom and community.

Learning from Indigenous Learners

Mitch Bourbonniere

This keynote will explore traditional concepts of learning based on decades of working with Indigenous learners in a variety of settings. This begins with appreciating the complex diversity in the Indigenous community and understanding the importance of genuineness, flexibility, and reciprocity. Creating safety in the classroom includes reflecting on the power of relationship and being aware of how all things are interconnected. Respecting positive subtle humour, valuing peoples stories, and having faith in people's natural resiliency also contribute to teaching and learning through the power of story.

Transcultural Literacies: Alternative Spaces and Places of Learning in Cosmopolitan Times

Karen Magro

In an increasingly globalized world, transcultural literacies challenge educators to explore linguistically and culturally diverse pedagogies by disrupting normative assumptions about learning and literacy development. Alternative spaces and places for learning emerge when educators integrate diverse cultural narratives that reflect complexity and “landscapes of possibility.” Integrating emotional, social, and cultural intelligence into the curriculum explores and reflects on the values, beliefs, and ideals that guide practice. This presentation will explore the way powerful texts and transformative teaching can help learners explore culture, gender, religion, nation, ethnicity, race, and class; and bridge the gap between global and local literacies.

Settler - Indigenous Relationship Building

Tessa Blaikie Whitecloud & Hanwakan Blaikie Whitecloud

These two are as committed to a Canada free of hate as they are to sustaining the love they have between one another. As a Dakota man and Settler woman, their conversations around reconciliation are passionate by their personal lives, and are informed by their work & research. Tessa's MA Thesis looked at the role privileged people have to play in Indigenous Justice Issues – not as Allies but as Canadians whose country was founded on injustices. Hanwakan creates profiles of Urban Indigenous people as he works to create an identity for himself outside of stereotypes and barriers. They both work actively with Winnipeg's underloved, whether formally at 1JustCity as Fund Developer for Tessa or informally through mentorship for Hanwakan. They'll give you concrete ways you can participate in making the Canada you believe in – founded on diversity – rooted in the value of equity and building relationships for unity.

In addition to our fabulous keynote presentations and intriguing workshops, ICIE publications will be available for purchase at the conference “bookstore”. Hot off the press titles for 2017 include *Expanding Voice and Vision in Literacy Education* (Magro, 2017) and *Innovation Education* (Taisir Subhi Yamin, Ken McCluskey, Todd Lubart, Don Ambrose, Kari McCluskey, and Sandra Linke, 2017).

For more information or if you are interested in joining us, please contact Kari McCluskey, Coordinator of *Lost Prizes*, at: ka.mccluskey@uwinnipeg.ca

Submission Guidelines

Manuscripts submitted to the **IJTDC** should contain original research, theory or accounts of practice. Submission of a manuscript to the **IJTDC** represents a certification on the part of the author(s) that it is an original work, and that neither this manuscript nor a version of it has been published previously nor is being considered for publication elsewhere. If accepted by this journal, it is not to be published elsewhere without permission from the **IJTDC**. However, conference papers included as part of conference proceedings may be considered for submission, if such papers are revised in accordance with the format accepted by this journal, updated if need be, and full acknowledgement given in regard to the conference or convention in which the paper was originally presented.

Electronic submission

Authors should send the final, revised version of their articles in electronic form. Submit the final version to the journal's editorial office.

All submitted papers are assessed by a blind refereeing process and will be reviewed by at least two independent referees. Therefore, avoid clues in the text which might identify you as the author. Authors will receive constructive feedback on the outcome of this process. Please note that the process will take two to three months in duration.

Manuscripts should be written in accordance with the publication manual of the American Psychological Association (6th Edition). For example, the following should be adhered to:

Title page

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Should consist of a maximum 200 words on a separate page. The abstract must, if the result of empirical research, briefly outline theoretical basis, research question(s) (in one sentence if possible), methodology and instrumentation, sample(s) and pertinent characteristics (e.g., number, type, gender, and age) as well as the main findings of the study (if applicable include statistical significance levels). Also, include conclusion and the implications or applications.

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