ADVANCES IN CREATIVITY AND GIFTEDNESS

# Creatively Gifted Students are not like Other Gifted Students

## Research, Theory, and Practice

Kyung Hee Kim, James C. Kaufman,
John Baer and Bharath Sriraman (Eds.)

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Volume 4

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***Edited by***
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3. equity and justice, ethics and altruism; service to, and integration with, the community and the world.
4. attention to the whole child; integration of the cognitive, social, emotional, motivational, and physical aspects of the student.
5. special attention to the social and emotional development of students.
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9. lifelong learning.
10. low student-faculty ratio.
11. faculty autonomy in curriculum design, to the extent possible.
12. a prominent place for the arts in the curriculum
13. inquiry-based and lab-based approaches to science teaching.
14. a balance between product and process emphases in curriculum and instruction.

Contributors to this book include researchers in gifted education, current and former editorial board members of The Roeper Review, in addition to school personnel collaborating as coauthors and/or as field-based partners in empirical projects.

# Creatively Gifted Students are not like Other Gifted Students

*Research, Theory, and Practice*

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# DEDICATION

To my dear friends, Jim Weiner and Chip Goldstein- KHK

For Jack Naglieri, who has been a childhood babysitter, mentor, groomsman, collaborator, and a beloved, trusted friend – JCK

For Sylvia — JB

To my father Capt. S.R. Sriraman on his 75th birthday [10-08-2012]

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# ACKNOWLEDGEMENTS

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KYUNG HEE KIM, JAMES C. KAUFMAN, JOHN BAER AND BHARATH SRIRAMAN

# INTRODUCTION TO CREATIVELY GIFTED STUDENTS ARE NOT LIKE OTHER GIFTED STUDENTS

*Research, theory, and practice.*

This book focuses on the needs of creatively gifted students and how schools can meet those needs. Creatively gifted students show exceptional levels of creativity. These students may or may not have developed other talents and abilities, yet. Even when their abilities and talents are apparent, the needs of creatively gifted students may not be recognized by current gifted education programs. Regardless of whether a creatively gifted student is included in these programs, schools often inadvertently ignore their special needs. The goal of this book is to share the newest research about the attributes and needs of creatively gifted students and the kinds of programs that best address those special needs.

Most gifted education programs have the promotion of creativity as one of their goals, and many include creativity in their screening process. Regardless, a large and often overlooked gap remains between the way gifted education programs treat creatively gifted students, and the needs of those students. Exhibiting creativity may help a student in the selection process and creative-thinking activities may be part of the program itself, but the special and important needs of creatively gifted students are neglected. The result of this gap is creative underachievement by individual students, and a collective diminishment in world achievement by virtue of what these potential creators never do.

Students in a gifted education program with extreme math or science or language abilities will be given opportunities to accelerate math or science and language arts studies. Students with outstanding music or artistic abilities will have opportunities to develop the domain-specific skills and acquire the domain-specific knowledge in those areas of special talent. Rarely is any program or provision made for a student who is extremely creative, who has yet to achieve high accomplishment in any particular area.

This book addresses the following topics:

- social needs of creatively gifted students and the importance of engagement as a key component of student academic success (see, e.g., McCormick and Plucker's chapter on "Connecting Student Engagement to the Academic and Social Needs of Creatively Gifted Students")

*K. H. Kim, J. C. Kaufman, J. Baer and B. Sriraman (Eds.), Creatively Gifted Students are not like Other Gifted Students: Research, Theory, and Practice, 1–2.*

- assessment for student selection (see, e.g., Piirto's chapter, "But Isn't Everyone Creative?")
- ways to nurture creativity in teachable "micromoments" in the classroom (see, e.g., Beghetto's chapter, "Nurturing Creativity in the Micro-moments of the Classroom")
- aligning program goals with selection procedures (see, e.g., Baer's chapter on "Aligning Program Goals, Student Selection, and Program Activities")
- applying a dual process (conscious/unconscious vs. explicit/implicit) model to understanding creative giftedness (see Eskine and Kaufman's chapter, "Grounding Creative Giftedness in the Body")
- importance of early experiences and implications of making giftedness productive for talented students (see, e.g., Paik's chapter: "Nurturing Talent, Creativity, and Productive Giftedness: A New Mastery Model")
- applying visual teaching and learning strategies along with principles of design to foster creative development within and across curricular areas (see, e.g., Daniels's chapter, "Picture This: Integrating Visual Thinking, Design, and Creativity Across the Curriculum")
- career development for creatively gifted students (see Kerr and Vuyk's chapter on "Career Development for Creatively Gifted Students – What Parents, Teachers, and Counselors Need to Know")
- use of neuroimaging techniques to highlight the neuroplasticity of children's brains vis-à-vis the development of creativity (see Jung and Ryman' chapter on "Imaging Creativity")
- relationships between intelligence and creativity and between reasoning ability and divergent thinking (see, e.g., Baudson and Preckel's chapter on "Intelligence and Creativity: Their Relationship with Special Attention to Reasoning Ability and Divergent Thinking. Implications for Giftedness Research and Education")
- use of technology in nurturing creativity (see, e.g., Hong and Ditzer's chapter, "Incorporating Technology and Web Tools in Creativity Instruction")
- role of genetics in creative talent (see Simonton's chapter on "The Genetics of Giftedness: What Does It Mean to Have Creative Talent")
- techniques that increase and utilize creativity in play (see, e.g., Russ, Fehr, and Hoffmann's chapter on "Helping Children Develop Pretend Play Skills: Implications for Gifted and Talented Programs")
- how to improve the critical and evaluative thinking skills of creatively gifted students in ways that enhance both idea generation and selection in the writing process (see, e.g., Pfeiffer and Thompson's chapter on "Creativity from a Talent Development Perspective: How It Can Be Cultivated in the Schools")

The overarching goal of this book is to share with scholars, educators, and practitioners the latest research on creatively gifted students and the kinds of programs that best meet the unique needs of these students. Through the knowledge and experiences shared here, we hope to help close the gap between what these children need and what they are getting.

RONALD A. BEGHETTO

# NURTURING CREATIVITY IN THE MICRO-MOMENTS OF THE CLASSROOM

I vividly recall, as a new classroom teacher, trying to find ways to incorporate creative learning activities into my teaching. I tried everything, including: mock-trials, simulations, skits, student presentations, and alternative ways for students to represent their knowledge (e.g., drawings, animations). I transformed various spaces throughout the school into venues for creative expression (e.g., auditorium stage, cafeteria, computer lab, classroom hallways) and used all the newest technological tools available (*Hypercard,* computerized painting programs, and rudimentary video-game generators). These creative learning activities provided opportunities for my students to express themselves in ways that were absent from my everyday classroom and let their creative talents shine. I felt then, as I do now, that such activities served as a vehicle for encouraging students' creative expression – uncovering otherwise hidden creative talent and potential.

Although I did my best to incorporate such activities in my teaching, I quickly realized that I simply didn't have the time, curricular freedom, or energy to incorporate these creative activities in my teaching with a high level of frequency – let alone make space for such activities in my everyday classroom. I also started to question whether the amount of the time spent on creative learning activities could be justified – worrying that these creative learning activities were coming at the expense of more direct academic subject matter teaching and learning. I was confronted with a seemingly unsolvable dilemma: How can I continue to support student creativity when it is so resource intensive and seems to come at the cost of academic subject matter learning?

Now, with the benefit of insights gleaned from my research and work with creativity in the classroom, I recognize that what was most problematic about this situation was that I was equating product with process. I believed that the only way to support creative potential was through creative learning activities. Although such activities served as important opportunities for allowing students to produce their learning creatively, I failed to realize that these activities were not sufficient for nurturing creative potential. By viewing the development of creative potential as separate from the academic curriculum I was actually missing opportunities to support students' creative potential in the process of the everyday moments of my classroom.

In this chapter I hope to demonstrate that everyday moments of the classroom represent defining moments when it comes to nurturing student creativity. What

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teachers do in these moments has important implications for whether opportunities for nurturing student creativity will be addressed or missed. More specifically, I open the chapter by discussing how creativity enhancement efforts are typically conceptualized as extracurricular (i.e., separate from the everyday teaching of academic subject matter). I then discuss the creative potential of unexpected micromoments and the nature of such moments in the classroom. Next, I discuss how teachers often find themselves choosing between *attempting to be understood* versus *attempting to understand* when confronted with unexpected micromoments. I close with a discussion of the slight adjustments that all teachers can make to better support creativity in the micromoments of their everyday classroom.

## CREATIVITY ENHANCEMENT EVERYDAY OR EXTRACURRICULAR?

Teachers commonly view creativity enhancement efforts as "extra-curricular" (Aljughaiman & Mowrer-Reynolds, 2005) and separate from the everyday teaching of academic subject matter. This may, in part, be due to the way the identification and enhancement of creativity became systematized in U.S. public schools following Sidney Marland's (1972) report to the U.S. Congress on the education of gifted and talented students. Marland's report represents a watershed moment for creativity enhancement in public schools. His report noted that "creative and productive thinking" was one of six possible indicators of giftedness. Most importantly, for the present discussion, the report provided a strong argument for a specialized or separate education for students who demonstrated high-levels of potential or achievement. The idea that creativity should be separate from the general education curriculum was codified in the report and, in many cases, has been enacted in K12 schooling ever since. Consequently, sustained efforts to nurture student creativity have largely fallen on the shoulders of gifted education teachers and have become separate from the mainstream academic curriculum.

Aside from the occasional creative teaching and learning activities used by general education teachers, it has been gifted education teachers who have consistently played the important and, in some cases, solitary role in keeping creativity in the consciousness and curriculum of K-12 schools[1]. Placing the responsibility to develop students' creative potential in gifted education programs is problematic on several levels. First, the development of creative potential needs to be a shared responsibility of all educators. When teachers in gifted and talented programs are given the primary responsibility of developing student creativity it can reinforce the common (mis)conception that creativity is a trait limited to an elect few (Plucker, Beghetto, & Dow, 2004) – namely those who make the cut for gifted education – rather than a capacity of all students.

Moreover, limiting creativity enhancement efforts to specialized curricula can reinforce a belief on the part of general education teachers that – aside from occasional creative learning activities and helping to identify students for gifted education programs – nurturing creativity is not a part of their everyday curricular

responsibility. The belief that creativity should be separated from academic subject matter learning is not limited to general education teachers. Gifted educators have also conceptualized creativity as important but separate from academic learning (Beghetto & Kaufman, 2009). For instance, Callahan and Miller (2005) have described interrelated "academic" and "innovative" paths in their Child-Responsive Model of Giftedness. Similarly, Renzulli (2005) has described two types of giftedness: "schoolhouse giftedness" and "creative-productive giftedness."

Finally, and of most relevance to the present chapter, focusing on creativity development during pre-specified times and in pre-specified spaces reinforces the belief that creativity is something that can be switched on and off with the ring of a school bell. When teachers hold this belief, creativity enhancement efforts are limited to a predetermined "creativity time" that can, if time permits, be scheduled around academic learning. The problem with this belief, as illustrated in the opening vignette, is that "creativity time" inevitably starts to compete with academic learning time. Moreover, and most problematically, the notion of a separate "creativity time" sets the conditions by which teachers will miss opportunities for developing creativity during the unexpected, non-routine, and off-script moments of the everyday classroom.

None of this is to say that extracurricular creativity enhancement efforts are unimportant or have no value. Teachers can and do use predetermined times and spaces for creativity related activities (e.g., scheduled performances, displays of work, discussions on strategies and techniques used for convergent and divergent thinking). Moreover, there is research to suggest that structured creativity enhancement efforts can support the development of creative performance outcomes (see Beghetto, 2007a; Nickerson, 1999; Scott, Leritz, & Mumford, 2004; Isaksen & Treffinger, 2004). What I am arguing for here is simply that extracurricular efforts not be viewed as sufficient for developing students' creative potential.

In addition to extracurricular creative activities and performances, the full development of students' creative potential requires that teachers recognize opportunities to support creativity in their everyday teaching and learning of academic subject matter. Everyday moments of the classroom serve as a crucible for creativity that, in part, determines whether students will develop healthy self-beliefs in their creative ability (Bandura, 1996; Beghetto, 2006); learn when, why, and how creative expression is warranted (Kaufman & Beghetto, in press); and how creative ideation is related to developing a deeper understanding of what they are learning (Beghetto & Kaufman, 2009). Developing an understanding of the creative potential of everyday micromoments is a necessary first step in ensuring that opportunities to support creative potential are recognized rather than overlooked.

## *Creative Micromoments*

Creative micromoments are brief, surprising moments of creative potential that emerge in everyday routines, habits, and planned experiences (Beghetto, 2009). Micromoments occur anytime someone finds oneself having gone off-script, playing

a wrong note, drifting away from the plan, or otherwise entering uncertain territory. The surprising unscripted nature of micromoments opens windows of creative opportunity that, in turn, determine whether creative potential will be recognized and developed.

Creative professionals (e.g., artists, musicians, improvisational actors, photographers, scientists) recognize and capitalize on the creative potential of micromoments. Professional photographer Bill Lockhart (2012), for instance, has noted that his most cherished photographs – of the tens of thousands he has taken – are those in which he was able to capture specific fleeting moments of time – yielding images of surprising beauty (e.g., sunlight breaking over tree tops and creating a brief fiery halo of light).

Improvisational performers also recognize and rely on the creative potential of micromoments. For instance, one of the first techniques that improvisational comedians learn is the "Yes, and" technique (Halpern, Close, & Johnson, 1994). The "Yes, and" technique helps performers welcome and build on surprising ideas, actions, and utterances of their improvisational teammates. For accomplished improvisational performers, it is probably fair to say that "Yes, and" is more of a disposition than a technique – allowing them to develop and explore unexpected creative directions in their performances.

## *Classroom Micromoments*

In the classroom context, creative micromoments emerge anytime the curriculum-as-planned meets the curriculum-as-lived (Aoki, 2005; Beghetto & Kaufman, 2011). This meeting of the *planned* versus *lived* curriculum creates an unexpected and momentary opportunity for new possibilities; a generative curricular space for students and teachers to explore, learn, and experience something new, unscripted, and unplanned. Curriculum theorist Ted Aoki (2004) has described this this opening as "a space of generative interplay between the planned and lived curriculum…a site wherein the interplay is the creative production of newness, where newness can come into being… an inspirited site of being and becoming" (p. 420). One of the most common, yet subtle, classroom micromoments – which has implications for the development of students' creative potential – occurs whenever a student shares an unexpected idea.

When students respond in unexpected ways to known answer questions, teachers are confronted with a micromoment decision. Although there are a variety of ways teachers can respond, many of these responses can be represented in the following two options:

- Option A: Attempt to understand. When teachers choose this option, they attempt to understand the potential relevance of students' unexpected ideas. This requires that teachers are willing to spend class time exploring ideas that may take them off-course and result in curricular uncertainty.
- Option B: Attempt to be understood. When teachers choose this option they try to get students to understand the response that they, as teachers, expected to hear.

This typically involves attempting to redirect unexpected student responses in order to get the class "back on track." Doing so may result in potential creative ideas going unnoticed.

There are costs and benefits inherent in choosing between these options and it is often difficult to discern whether a particular student's unexpected response represents potential confusion, willful intent to be disruptive, or expression of creative ideation. Consequently, teachers typically rely more on habitual patterns of classroom talk (Cazden, 2001) in choosing between these options and, as a result, frequently redirect, rather than explore, unexpected ideas (Beghetto, 2010; Kennedy, 2005). By developing a better understanding of the potential costs and benefits of these options, teachers will be in a better position to respond more purposefully when confronted with this micromoment decision.

## TO UNDERSTAND OR BE UNDERSTOOD

Attempting to understand a student's unexpected response, in the context of a class discussion, requires the willingness of the classroom teacher to take the curricular risk of expending precious class time exploring an "off-script" idea. Although there are legitimate curricular concerns involved in exploring unexpected ideas (e.g., drifting into curricular chaos, wasting precious class time, generating confusion amongst students), unexpected student comments warrant some level of recognition and exploration by teachers. This is because, in the context of the classroom, a potentially creative idea may first appear as an unexpected idea (Beghetto, 2009).

Unexpectedness or novelty is one of the most readily recognizable traits of creative ideation (Plucker et al., 2004). Of course, an unexpected idea is not necessarily a creative idea. As any teacher knows, following an unexpected idea can take the teacher and the entire class down a confusing and muddled curricular rabbit-hole. In order for an idea to be creative it requires a combination of unexpectedness or novelty *and* meaningfulness, usefulness, or appropriateness as defined within a particular context or set of task constraints (Plucker et al, 2004; Kaufman, 2009; Sternberg, Kaufman, & Pretz, 2002). In this way, unexpected ideas can be thought of as potential signifiers of creativity. However, in order to determine whether an unexpected idea is a creative idea, teachers often need to draw out a student's unexpected idea to help assess whether and how the idea is meaningful – and thereby creative – in the context of the class discussion.

An example might help illustrate. Consider, for instance, a first grade teacher who wants to quickly review a few basic math facts prior to introducing a more complex math activity. During the review, a student utters an unexpected response, as portrayed in the following hypothetical classroom dialogue[2]:

*Teacher*: Let's quickly review some of our math facts. What does two plus two equal?

*Multiple Students:* Four!

*Teacher:* Correct. Two plus two equals four…. Sophia, you're raising your hand, do you have a question?

*Sophia:* Well, I think that two plus two can sometimes equal two…

*Teacher:* Hmm. Okay, Sophia, can you give us an example of when two plus two can equal two?

*Sophia:* Yes. If you have two hungry cats and two fat mice, you end up with two fed cats.

*Teacher:* Yes, I suppose in *that* case two plus two would equal two. Can anyone else think of an instance when two plus two equals something other than four?

In the above vignette, the micromoment occurs in turn four of the dialogue. Sophia's unexpected response that "two plus two can sometimes equal two" represents a momentary rupture in the curriculum-as-planned. Instead of quickly reviewing math facts as the teacher intended, Sophia introduced a moment of uncertainty into the teacher's sequence of asking a known answer question. As mentioned, micromoments, such as the one illustrated in the above example, serve as a decision point for teachers. They are decision points because in that moment the teacher needs to make a split-second decision (e.g., *Do I spend class time attempting to understand Sophia's unexpected comment to this known answer question?* or *Do I quickly correct Sophia – helping her understand the known answer – so as not to waste class time and create additional confusion?).*

Taking the time to explore a student's unexpected comment can, as the above vignette attempts to illustrate, reveal creative insights that can take a lesson in a new and generative direction for students and the teacher. Although the two-plus-two example may seem a bit trivial, there are examples that demonstrate how exploring unexpected ideations can lead to real-world creative contributions that go beyond the walls of the classroom.

One example (as reported by Lofing, 2009) is that of Gabriel Leal, a 6th grade student and son of an entomology professor at UC Davis, who had the unexpected insight that pistachios might serve as a better bait (than a commonly used almond mixture) to trap and control navel orangeworms (a major pest of almond and pistachio growers). Gabriel's insight was based on his personal experience (preferring the taste of pistachios over almonds). Given that Gabriel's insight ran counter to prior research and the practice of growers, his idea was unexpected and could have been easily dismissed by his teacher (e.g., "Gabriel, there is already a known solution to this problem, please find another problem for your project"). Instead of being redirected, he was encouraged and allowed to test his idea in a controlled experiment (using his father's UC Davis Lab, under the voluntary supervision of one of his dad's colleagues). The results of the experiment confirmed Gabriel's insight and have subsequently been reported at a professional conference – contributing new

knowledge to the science and practice of pest control for almond and pistachio growers.

As these examples illustrate, encouraging and exploring unexpected ideas can lead to the development and expression of creative potential. However, doing so requires that teachers suspend curricular certainty and, instead, engage in a form of open-ended "dialogic pedagogy" (Matusov, 2009) in which teachers are willing to explore responses that may lead to uncertain outcomes. This is easier said than done.

## ASKING KNOWN ANSWER QUESTIONS AND OTHER PATTERNS OF TEACHER TALK

Given that the act of teaching often involves helping youngsters develop an understanding of existing subject matter knowledge, the role of the teacher frequently involves asking known answer questions (Matusov, 2009). This conceptualization of the role of the teacher and the expectations that come along with it serve to create an easily recognizable pattern of classroom talk: teachers ask questions, students respond, and teachers evaluate the correctness of those responses. This pattern of talk has been called the "IRE pattern" (Mehan, 1979), which stands for *Initiate* (teacher asks a known answer question and students raise their hands), *Respond* (teacher calls on one student and the student shares his or her response, typically trying to match what the teacher expects to hear) and *Evaluate* (teacher informs the class whether the student's response is appropriate, correct or acceptable).

Of course, not all teachers adhere to the IRE pattern of classroom talk and even when they do, it is not always or necessarily detrimental (Cazden, 2001). However, it can become detrimental when used habitually and inflexibly. When this happens students learn that the goal of a class discussion is not to try to work out their own interpretation or understanding, but rather attempt to puzzle-out or guess the answer expected by the teacher (Black & Wiliam, 1998). This form of tacit learning seems to occur early and frequently in the K-12 schooling experience of students (see Beghetto, 2010b) and can be observed in the subsequent participation patterns of students during class discussions (e.g., a teacher asks a question and the only students to raise their hands are those who feel confident that they know what the teacher wants to hear).

Consequently, classroom discussions become more like "intellectual hide-n-seek" (Beghetto, 2007b) than opportunities for students to express and develop their own personally meaningful understandings. This is not to suggest that teachers intend their class discussions to turn into guessing games. However, this game of intellectual hide-n-seek is one of the unintended consequences that can occur when teachers habitually redirect unexpected student ideas to avoid curricular chaos.

## AVOIDING CURRICULAR CHAOS

Although encouraging and exploring unexpected student ideas provide opportunities for creativity to emerge, doing so can be an unsettling prospect for teachers.

Kennedy (2005), for instance, found that elementary classroom teachers frequently expressed a desire to avoid going "off-task" from the curriculum-as-planned. Kennedy noted that some teachers frequently mentioned a "fear of chaos, others a need to stick with the plan, others a personal need for order" (p. 264). Even prospective teachers (those preparing to teach) seem to harbor concerns about unexpected responses taking them off-task. Findings from a recent study of prospective middle and secondary teachers (Beghetto, 2007c), for instance, indicate that unexpected student comments were generally viewed as less preferable than more expected or relevant comments and also more likely to turn into potential distractions (e.g., "Comments of this type may be intended to distract from the discussion"; "As a new teacher, I fear getting manipulated to get 'off task'…").

The fear of drifting off-task can result in teachers viewing unexpected student responses as signifiers that their lesson is in danger of slipping into curricular chaos. When this happens, the primary goal becomes one of restoring structure and order. Consequently, instead of taking the time to explore and understand an unexpected student idea, teachers, like most people, focus more on the negative possibilities (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001) – viewing unexpected ideas as presenting too great a risk (Blair & Mumford, 2007) and thereby become more inclined to dismiss rather than explore unexpected ideas.

## DISMISSING UNEXPECTED IDEAS: AVOIDING CHAOS *AND* CREATIVITY

Dismissing unexpected ideas is an effective way to avoid curricular chaos. However, doing so comes at a cost. Just like exploring unexpected ideas involve risking chaos, habitual dismissal of unexpected ideas also involves risk – including everything from missing opportunities to recognize and develop students' creative potential to shaming students such that they are no longer willing to share their ideas or other forms of creative expression.

As mentioned, one particularly effective and common way to dismiss a student's unexpected idea is to redirect the student to get "back on track." Doing so represents a "soft dismissal" (Beghetto, 2009) in that the teacher attempts to gently, yet effectively eliminate uncertainty and regain control of the dialogue – directing students back to the expected outcome. Kennedy (2005), for instance, has reported that the elementary teachers she observed used this type of dismissal strategy by responding to students' "off-script" comments with statements such as, "We'll talk about this later" (p. 120). Teachers often use this type of dismissal to both appease the student and keep the lesson moving along (Kennedy, 2005). The problem is not in the occasional need to redirect ideas or in suggesting to students that an unexpected idea needs to be revisited at a later time, but rather when teachers, for whatever reason, fail to revisit those dismissed ideas. When this happens the "soft" dismissal – particularly if it occurs with frequency – isn't likely to be experienced by the student as gentle or benign. Rather, such dismissals can be experienced as a form of "devaluative feedback" (Bandura, 1997) that can undermine students' confidence

in their ideas and serve to dissuade them from being willing to share their ideas in the future.

Moreover, not all dismissals are delivered so softly. In some instances, students experience micromoment dismissals as a quite harsh or even shaming. This, in turn, can result in the experience of "creative mortification" (Beghetto, 2011) in which subsequent creative expression is indefinitely suspended. A student who aspires to be a poet, for instance, may stop writing poetry after having received particularly harsh and shaming evaluative feedback from a teacher. Examples of creative mortification extend beyond the walls of the classroom – including a variety of creative performance domains such as dance, writing, singing, and sports (Beghetto, 2011). It is therefore important that teachers are aware of not only how and when they are providing evaluative feedback but also how youngsters experience that feedback.

## DUAL RESPONSIBILITY: SUPPORTING LEARNING & CREATIVITY

Teachers, who are committed to supporting creative potential, take on the dual responsibility of ensuring that students are learning academic subject matter and, at the same time, developing their creative potential. Indeed, the most effective teachers balance curricular fluidity with the curricular structure (see Sawyer, 2011). This involves providing students with opportunities to express their unique and personally meaningful ideas – what has elsewhere been called mini-c creativity (Beghetto & Kaufman, 2007) – and also helping students recognize whether and how those ideas fit within the academic conventions and constraints of a particular classroom discussion (Beghetto, 2007b). In this way, teachers can help students develop their creative confidence or *creative self-efficacy* (Beghetto, 2006; Tierney & Farmer, 2002) and their *creative metacognition* (Kaufman & Beghetto, in press).

Creative self-efficacy, like other forms of self-efficacy (Bandura, 1996), is the confidence in ones ability to be creative in a particular context and is influenced by prior experiences at successfully expressing one's creative ideation and receiving supportive evaluative feedback. Creative self-efficacy determines, in part, whether students will be willing to express their creativity when given the opportunity (see Bandura, 1996; Beghetto, Kaufman, & Baxter, 2011). Creative metacognition, as defined by Kaufman and Beghetto (in press), refers to a combination of self-knowledge (knowing one's own creative strengths and limitations) and the contextual knowledge (knowing when and how creative expression might be appropriate). Metacognitive skills are thought to be essential to successful creative performance and expression (Davidson & Sternberg, 1998; Feldhusen, 1995) and serve as key area of focus for developing the creative potential of youngsters (Kaufman & Beghetto, in press).

Classroom micromoments provide opportunities to help students develop both their creative self-efficacy and creative metacognition by providing opportunities

for students to express their creative ideas and receive feedback on those ideas. The good news for teachers is doing so doesn't require a radical shift in one's curriculum but rather a slight adjustment to what many teachers do already.

## SLIGHT ADJUSTMENTS FOR REALIZING THE CREATIVE POTENTIAL OF MICROMOMENTS

As has been discussed, nurturing creative potential requires that teachers recognize how classroom micromoments present opportunities for students to express and receive supportive feedback on their creative ideation. Although there are a variety of ways that teachers can make meaningful strides in attempting to nurture students' creative potential in the micromoments of their classroom, the following suggestions summarize key themes highlighted in this chapter:

- *Hold your lesson plans lightly.* Be prepared for unexpected ruptures in the planned curriculum. Recognize that these micromoments frequently occur and are not necessarily signs of impending curricular chaos. Keep in mind that unscripted micromoments often serve as defining moments when it comes to identifying and supporting creative potential. Rather than attempt to "plan-away" or quickly dismiss unexpected moments, prepare for them to occur and practice dwelling in those moments in an effort to recognize the creative potential of unexpected student ideas. This involves being willing to make "in the moment" adjustments to planned lessons to better accommodate new curricular possibilities that may emerge.
- *Explore first then evaluate*. The typical pattern of classroom talk involves teachers immediately evaluating the correctness of a student's responses. Instead of immediately evaluating the correctness of an unexpected student idea, try approaching those ideas with a sense of curiosity and willingness to explore them (e.g., "I wasn't expecting that…can you help us understand how that idea fits with our discussion?" "Can you provide an example of what you mean?"). This involves encouraging students to share their own ideas and interpretations, carefully listening to the ideas that they do share, and letting students know when their ideas do not seem to fit or make sense given the constraints and conventions of the subject being discussed.
- *Provide balanced feedback and opportunities to revisit ideas.* Provide the kind of evaluative feedback that not only attempts to build students' confidence in their ideas, but also helps students develop the self and contextual knowledge necessary to know when and how their ideas fit given the academic learning constraints, conventions, and standards of the particular activity or task. This involves providing students with multiple opportunities to revisit or resubmit their ideas in relation to the academic subject matter being taught (e.g., establishing a virtual or actual "idea dropbox" to allow students to elaborate on or resubmit ideas; using a portion of the chalkboard as an "idea parking lot" for ideas that

are not fully developed but can be revisited, and a class notebook that includes an "idea garden" for new ideas and even an "idea grave yard" for ideas that have been put to rest in light of subsequent learning and insights).

## CONCLUSION

Many teachers experience the same dilemma described in the opening vignette of this chapter: Wanting to incorporate creative learning activities into the classroom but feeling that doing so comes at the cost of students' academic subject matter learning. The goal of this chapter was to highlight ways that teachers might rethink and work towards resolving this dilemma by recognizing that nurturing creative potential can also occur in the micromoments of the everyday classroom. Although it is not always easy to take the time to explore the potential of these moments, doing so does not require radical changes to the existing academic curriculum. Instead, it requires an "in the moment" mindfulness to explore and provide meaningful feedback to students' unexpected ideas. In this way, teachers can better ensure that opportunities for nurturing students' creative potential are realized rather than missed.

## NOTES

[1] This is not to say that general education teachers do not teach with and for creativity. There are numerous examples of creativity enhancement efforts intended for and delivered by general education teachers (see Beghetto & Kaufman, 2010). Still, even with these efforts, systematic creativity enhancement efforts are more typically found in gifted education programs and curricula.

[2] This hypothetical dialogue is based on an actual exchange with first graders reported in Matusov (2009).

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EUNSOOK HONG AND CHRISTINE DITZLER

# INCORPORATING TECHNOLOGY AND WEB TOOLS IN CREATIVITY INSTRUCTION

## INTRODUCTION

The Global world is constantly transforming, with new technologies changing the way we learn, communicate, and collaborate. The ways of working and learning change with emerging innovations through the World Wide Web and Web 2.0, and 3.0 tools, a trend expected to continue (PEW Internet & American Life Project, 2010). The "Digital Native Generation" adopts the changes easily, whereas the "Digital Immigrant Generation" greets the changes with hesitancy and skepticism (Prensky, 2001).

Technology in the modern age has changed the way we retrieve and share information. This statement describes well the technology trend of the past two decades, but the latest advancements in technologies make it even more apparent. Of the changes we have seen in the way information is utilized, students' approach to learning has leaped into a new era; students are creating their own knowledge from the vast Web information at their fingertips (Siemens, 2006a; Prensky, 2001).

Although instructional designers, educational researchers as well as educators in general have applied new technologies in the interest of enhancing student motivation and learning (Allen & Seaman, 2007; Azevedo & Cromley, 2004; Bell & Akroyd, 2006), with the advent of new Web tools, Facebook, and smart phones available to virtually anyone with access to the Internet, the field of education requires a giant shift in teaching in order to incorporate ways students learn (Greenhow, Robelia, & Huges, 2009). This trend applies to students of all ages and all levels and types of achievers such as students with learning difficulties as well as regular, intellectually gifted, and creatively talented students.

With the advancement of these technologies and the proliferation of unvalidated Web information and applications, however, complexities arise and enter the teaching and learning arena. The knowledge students create is often an unguided mix of facts that may or may not be correct. The knowledge scattered throughout the World Wide Web is not organized for optimal learning. This phenomenon requires students to improve skills to help themselves regulate their Web learning behaviors to maximize learning and creativity in academic as well as in non-academic activities (Greenhow et al., 2009). Teachers not only need to be aware of what students are encountering in

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the Internet world but also have to learn new technologies to take advantage of this development in teaching students to be creative users of information. To be creative users and creators of their own knowledge and skills, students need to be analytical and critical thinkers as well as innovative, divergent, and creative thinkers.

Although e-learning, distance learning, Web-based learning, and virtual schools are increasing (Allen & Seaman, 2007; U. S. Department of Education, 2010b; Watson, Murin, Vashaw, Gemin, & Rapp, 2010), most students at the time of writing the chapter continue to learn in classrooms. Classroom teachers have opportunities to use their classroom instruction to promote creative thinking in students by using tools already familiar to students. However, for teachers to promote creativity in the classroom, creativity needs to be recognized and valued and changes in educational processes should occur, beginning with innovation in curricula to encompass creativity (Shaheen, 2010; Turner-Bisset, 2007; Wilson, 2009). Preservice and inservice teachers, especially regular classroom teachers, need to be educated on creativity in order to demystify the creative process (Plucker, Beghetto, & Dow, 2004; Sternberg & Lubart, 1999) and help them learn characteristics of creative students and facilitate creative thinking and creative performance (Cropley, 2006; Hong, Greene, & Hartzell, 2011; Hong & Milgram, 2008). This is particularly important because teachers often have misconceptions about creativity and creative students' classroom behaviors (Aljughaiman & Mowrer-Reynolds, 2005; Fleith, 2000; Runco, Johnson, & Bear, 1993). Numerous studies have demonstrated that teachers tend to carry negative attitudes toward creative students (Dawson, 1997; Torrance, 1963), underscoring the need to examine whether classroom teachers are equipped to guide and facilitate creativity in the classroom, especially in the e-learning environment.

In this chapter, we discuss creative learning and teaching in the Internet era with WWW and advanced Web tools. We begin with the characteristics of students and technology in the 21st century. We then discuss creativity in education in the 21st century, and creativity in the classroom, followed by conclusions.

## *Students in the 21st Century: Digital Natives*

The generation of youth today is often referred to as digital natives (Prensky, 2001) or "n-gen" (Downes, 2005) who have interacted with digital technology from an early age (Bennett, Maton, & Kervin 2008; Jones & Shao, 2011). They have grown up in an environment of computer technology that shapes how information is developed and shared and how knowledge is gained and created. The introduction of the Apple Macintosh in January 1984 was a pivotal moment in modern technology. Within months, over 50,000 were sold (Long, 2008) and the digital native generation was born. The parents who provided the computer and technology to their children are the digital immigrants. They were not born to the digital age, but have grown to use the tools. The digital immigrant, including many current teachers, are often less eager to embrace emerging technologies and see students as they were in the past when new technologies were yet to emerge (Prensky, 2001). The digital natives, on

the other hand, embrace new technologies quickly, and as Prensky (2001) stipulates, they are not likely to change back to older technologies. They take the open source technologies and use them as intended by builders, but they also frequently create new uses. They play, manipulate, re-create, and share what they discover (Downes, 2005; Siemens, 2006a).

However, unguided learning is hardly optimal whether the learning takes place in or out of the classroom. In addition, the vast information on the Internet can be damaging to education and decision making, as reported in articles in popular media such as, "Does Google makes us stupid?" (Anderson & Rainie, 2010) and "I can't think," a recent Newsweek article (Begley, 2011) included in the cover story, "Brain freeze: How the deluge of information paralyzes our ability to make good decisions." If the educator is a digital immigrant, the difficulties that the vast information on the WWW brings to students may not be on her or his radar, for example, in relationship to the importance of giving critical thought to how information may be used for school projects. Further, there is less chance that Web tools will be used for academic purposes, as educators of the digital immigrant generation speak a different language from the digital native (Prensky, 2001), rendering a gap between teaching and learning.

## TECHNOLOGY AS A LEARNING TOOL IN THE 21ST CENTURY

Thomas Friedman (2005) famously described how spreading globalization, increased by the rapid development of technology, not only made the world smaller but led to competition among nations in areas of innovation. Nations can either adjust to the change or fall behind. This applies especially to business, driven by science and technology (Britt, 2010). The years since Friedman made his 'flat world" declaration have only increased the speed of innovation and technical growth. According to Friedman, collaboration is the key to staying ahead in the flattening world. The World Wide Web is where this collaboration can most effectively grow, using the tools and technologies available and emerging. Technology can provide an independent learning environment and such an environment operates with a high degree of collaboration. Thus, the learning environment of today, with the Internet available virtually everywhere, while not considered to provide individualized experiences, does provide a climate for collaboration through shared use (Wilson, Liber, Johnson, Beauvoir, Sharples, & Milligan, 2010). Combining the creative skills of the digital native with the instructional objectives of classroom education is the challenge that educators face (Greenhow et al., 2009). In this section, we examine in more depth how technologies can be utilized in education as a learning tool.

**Web-based tools and technology in learning and creativity.** Learners today are engaging tools and technologies in their personal lives (Prensky, 2001). Ozkan (2010) asserts that the relationship between education and innovations in communication technology is inevitable since the Internet system has encircled the world. Learning spaces have changed and there are more choices for learning in all environments

from private to public, home, and school (Greenhow et al., 2009). Internet use and access among teens is rapidly approaching 100%. According to the Pew Internet and American Life Project, 93% of teens and young adults were online in 2009, along with 81% and 70% of adults of 30 to 49 and 50 to 64 years of ages, respectively (Lenhart, Purcell, Smith, & Zickuhr, 2010).

Activities on the Internet include social media and Web 2.0 tools for gathering, compiling, and sharing information (Downes, 2005). Youth today are more creative and interactive through Web 2.0 technologies and believe that use of these technologies in school would make them better prepared and engaged (Greenhow et al., 2009). They are collecting information, taking it apart, and recreating what is meaningful and useful to them (Siemens, 2006a). The "Millennial Generation," born between 1980 and1995, is technology savvy, but motivated by a flexibility and resourcefulness (Schorn, 2009). This generation uses gadgets and tech toys naturally and is motivated and creative in their use (Prensky, 2001). They are connected to people locally, nationally, and internationally.

**Personal learning environments and connectivism.** Learners today build personal learning environments (PLEs) to collect information and build knowledge (Attwell, 2007). PLEs are a network of connections to tools, data sources, social networks, and online collaborations on the Internet. The PLE is where information is gathered and circulated, and gives access to a variety of educational resources (van Harmelen, 2006). Digital natives can use the sources and tools consciously in PLEs. Savvy Internet users are able to filter the information they find, although the information mostly is not geared toward academic goals at present, unless they are directed to link the information with academic goals by classroom teachers. It is in the PLE that information is created and recreated. Further, PLEs are where youth are forming personal identities to share with others, presenting profiles of themselves through blogs, Wikis, Twitter, MySpace, and Facebook (Greenhow et al., 2009). In addition, a PLE is not limited to a single discipline; it is multi-disciplinary covering any range of subjects pertinent to the learner (Downes, 2006). Figure 1 is an example of a basic PLE, demonstrating how learners connect to the world around them. The importance of the PLE is gaining interest in education and is viewed as an emergent technology by 2014/2015 (Johnson, Adams, & Haywood, 2011).

***Creating knowledge: Connecting information.*** Connectivism is referred to as a "learning theory for the digital age" (Siemens, 2006a), and PLEs reflect connectivism. According to Siemens (2006a), the Internet is changing the nature and use of knowledge. The new cyclic, evaluative knowledge process includes: (a) co-creation—building on the innovations of others; (b) dissemination—analyze, evaluate, and filter; (c) communication of key ideas—shared through a social network; (d) personalization—based on experiences and reflection; and (e) implementation—acting on the new knowledge. The "connections" to new information drive the knowledge process, thus, there is always more to learn as the vast array of information at hand is unlimited.

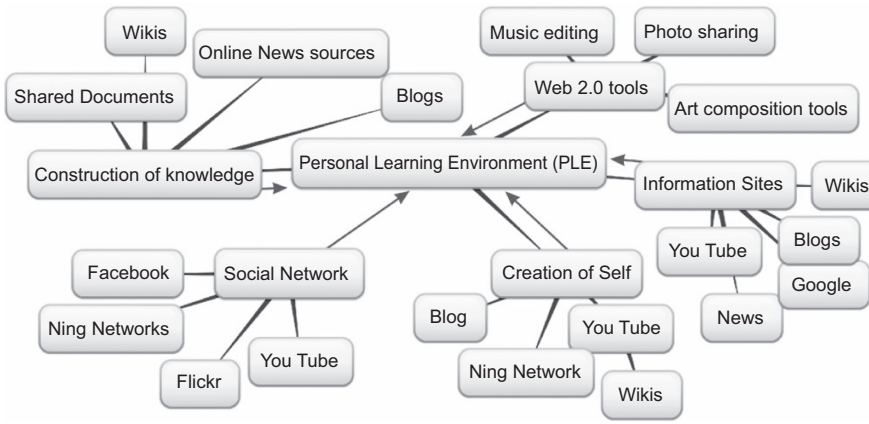


*Figure 1. An example of a basic Personal Learning Environment (PLE)*

Siemens (2006a) also points out that while knowledge is information, the reverse is not necessarily true. Evaluation, filtering, and personalization of information are critical. The role of a teacher in the creative use of the vast information is critical as they can guide students through the morass of information to make the information meaningful, valuable, and useful in the classroom setting. Knowledge formation is a transitory process. New information changes current knowledge as it is also disseminated into the experience of the knower (Siemens, 2006a). Knowledge, according to Connectivism, is in the connections among the information; that is, the connections create new knowledge. Nodes of information are connected to other nodes of information, creating a "personal learning center" (Siemens, 2006b). This process leads to innovation and creativity as there is a sense of openness and experimentation rather than acquisition of structured content.

The theory of Connectivism defines creativity as the ability to see new associations in the connections formed. That is, the process of creativity involves connecting, then making sense, followed by creating and re-creating (Siemens, 2006a). Many approaches to understanding creativity have involved connection, association, or combination of two or more ideas. Mednick (1962) proposed associative theory of creativity, defining creative thinking as the process of forming associative elements into new combinations which either meet specified requirements or are in some way useful (p. 221). Guilford (1959), before Mednick, also proposed that remote associations result in originality from divergent thinking. Adopting Guilford and Mednick's views of creativity as associative process, Wallach and Kogan (1965) also defined the creative process as producing multiple and unique associative contents. That is, remote associations represent original or unique relationships among associative elements that result in creative ideas. Thus, based on these perspectives and Siemens' Connectivism, it can be viewed that the creation of knowledge

is a "process of network formation" comprised of making meaningful networks, connecting those networks, and linking the pieces of knowledge (Siemens, 2006b).

To digital natives, creating arts, knowledge, and ideas, finding novel solutions to problems, and even generating original products can be conceived and conducted through the networking process. To digital immigrants, this notion may be viewed as impossible or too far out. However, the reality is that whether we are ready to accept it or not, the Internet, the rapid growth of technology tools, as well as the arrival of the digital native generation, have pushed us forward on this path. In this modern age, creative persons, creative processes, and creative products are perceived differently. Further, the place where creativity flourishes is beyond where individuals physically dwell; the space for creative activities is now virtually unlimited. Creative processes and activities now include individuals working in virtual space and collaborations with peers and any others—known and unknown to the individuals—nationally and internationally, making connections (MacCrimmon & Wagner, 1994; Pew Internet & American Life Project, 2010; Siemens, 2006b). Cross-disciplinary creative endeavors are more naturally and easily achieved in the Web environment, where sharing and acceptance of creative endeavors play a vital role in the learning of creators from various domains and all levels of creativity, especially mini-*c* (novel, subjective, and personally meaningful interpretation of experiences), little-*c* (everyday expressions of novel experiences), and Pro-*c* (professional and expert expressions of novel experiences) who has not yet attained Big-*c* level (legendary novel accomplishments) (Beghetto & Kaufman, 2007; Kaufman, Beghetto, Baer, & Ivcevic, 2010; Simonton, 2000).

***Fostering creativity with Web-based tools.*** The PLE serves another important purpose in fostering creativity. The social network allows creators to share their products and ideas with others at a single click of a button. They can gain acceptance of their products which not only encourages creativity, but also strengthens creative self-efficacy. That is, the sharing of creative works is an important component for fostering creativity. Being creative and creating new knowledge and creative ideas and products are important but not sufficient as it is necessary to have the recognition of peers for creative endeavors (Coler, 1968; Simonton, 1992, 2000). Recognition in a specific field is required for creativity to be meaning and useful (Csikszentmihalyi, 1999) as well as the understanding and adhering to the rules of that field (Coler, 1968). PLEs create an environment where implicit rules and values that can be used to distinguish merely interesting ideas from creative ideas are developed and evolve in rapid procession. Social media connections in a PLE open the way for their members to quickly share ideas and products. Twitter, Facebook, YouTube, Wikimedia, eBay, and Etsy are among the social networks used to get creative ideas and products to others in the field, known and unknown. Additional technologies for creativity and innovation are mobile devices, game-based learning, and cloud computing (Johnson et al., 2011). Those active in social networks, in general, are faster in sharing and gathering information (Kratzer & Lettl, 2009), affording more opportunities to have their creative ideas be recognized.

The meaning of learning has changed with the advent of Web 2.0 tools (Greenhow et al., 2009). Web 2.0 tools encourage artistic risk-taking and creativity in general (Zhang, 2009). The concept of classroom teaching needs to be expanded and teachers need to adapt to this change by incorporating these tools for creative use. Teachers should recognize the methods students use to communicate and share information within their network for personal connections (Levin & Arafeh, 2010). Contrary to assumptions, students are engaged in intellectual activity within networks; 60% of students report that they use their social networks for school activities (Greenhow et al., 2009). Although it is not easy for classroom teachers to learn new technologies as quickly as their students, teachers should be open to adopt new ways of learning and teaching, joining the growing ranks of creative users of new technologies.

Various software products are now available on the Web that meet the needs of learners who aspire to be artists, scientists, and those interested in other domains. Many creative talents in various areas are being discovered through the Internet such as talent discovered on YouTube. Aspiring singers and musicians play new and unique music, dancers demonstrate their dance skills, and stories, poems, and essays are published in blogs. One can find any information even for seeming ordinary skills such as "how to cut your own hair" in a creative way through the Internet. This is happening because individual members in PLEs willingly share their information for others to learn and create more original ideas. Web tools are available for individual and collaborative creative endeavors and are invaluable for fostering creativity. They can be integrated in the academic environment for individual and team creative projects that can be easily and efficiently shared by classmates, teachers, and the world, opening up for further opportunities for creative collaborations with individuals with different domain competences and creative strengths.

Web-based tools for the classroom. Web tools provide new opportunities for students to learn skills of communication, collaboration, and creativity (Solomon & Schrum, 2010). There are, quite literally, thousands of tools available.

Web-based tools can help overcome environmental and cultural barriers to creativity (Victor & Vidal, 2009). *Wetpaint* is a Wiki tool specifically designed for educational purposes. Wikis are neither time nor place based. Thus, students can create study groups, discussions, and collaborative wikis any time and any place. Group collaboration can include local participants or international participants. Critical and creative thinking skills can be fostered by addressing ill-formed questions with like-aged students in another culture. Class-to-class relationships with different countries are not new, but rapid exchange of ideas through a wiki enables students to think divergently. Wikis can also act as the disseminator of creative products such as essays, poetry, and digital arts. Blogs also serve this purpose.

*Art* can be used to foster creative talent. *Art Education 2.0* is a social networking website specifically for artistic creativity. The mission for this tool is to provide a global community of art educators with a site to explore uses of new technology (Art Education 2.0, 2011). Educators share ideas for increasing art with digital media. They share examples of student work and lesson plans. Some examples

include: (a) *One Day on Earth* is for documentary filmmakers, students, and inspired citizens who record the human experience over a 24-hour period; by participating in this historic event, individuals capture the diversity of life and culture on this planet; (b) *Trade* help teachers participate in a portrait swap with another school or host a Portrait Party in the classroom, and (c) *The Student Creative* is a new collaborative project with the goal of promoting how creativity is being taught in schools. The goal of Art Education 2.0 is to foster creativity in both teaching and learning.

Creative thinking can also be taught with Web 2.0 tools. *Bubbl.us* is an individual tool that enables students to create concept, or mind, maps. Figure 1 above (the original was in color) was created using this tool. Students can print, save, or share their maps with others. A part of creative thinking is seeing the connections between ideas. Bubbl allows students to create, modify, and re-create connections between concepts. Brainstorming can be visually displayed in a concept map of ideas and connections.

Students are often tasked with creating Powerpoint presentations. These are linear slides of information. *Prezi.com* has a presentation tool that allows the presenter to offer non-linear information to the audience. The presentation can go any direction or full circle. Learning to present information in a non-linear format also contributes to enhancing critical and creative thinking.

The implementation of modern Web-based technologies in the classroom is essential in today's world. Fostering creativity through these technologies is the most crucial element of such a program. It is time for a reconsideration of views on the purpose technology serves in education (Greenhow et al., 2009). Today's students are already engaged with technology, they are creative, and they are connected. Quite frequently they are ahead of their teachers in the uses of technology. To make the best use of the full range of Web-based tools for learning in today's global environment, teachers need to embrace creativity, learn new skills, and facilitate learning and creative thinking in their classrooms. The next section examines a critical component of needed facilitations, that is, facilitating self-regulated learning in technology-integrated learning environments.

**Technology-integrated learning environment: Facilitating self-regulated learning.** Technology-integrated educational programs have been developed by educational researchers through the application of various learning theories and pedagogical approaches to the design of Internet-based or stand-alone computer-based instructional materials. Technology-integrated learning tools, such as gStudy (Leacock & Nesbit, 2006), provides good examples of such endeavors. These programs demonstrate how metacognitive knowledge, learning through inquiry, and technologies can be incorporated to foster student engagement in collaborative inquiry and reflective learning. Learners today encounter vast information on the Internet, requiring self-regulation in connecting, learning, and creating knowledge.

As e-learning and distance education become a major part of the modern-day instructional format (Larreamendy-Joerns & Leinhardt, 2006; Tallent-Runnels

et al., 2006), students' ability to self-regulate their learning is critical. Teachers in typical classrooms meet students face-to-face and are able to structure the class and provide assistance for learning activities in person. However, learning on the Web and any other forms of online learning require students to be autonomous and use self-regulated approach to learning (Jung, 2001; Kearsley, 2000; Keegan, 1996; Peters, 1998). Students taking online courses need to control their own academic progress by planning and monitoring learning process and essentially becoming a responsible, disciplined, and independent learner (Allen & Seaman, 2007; Dabbagh & Bannan-Ritland, 2005; Moore & Kearsley, 2005). That is, students need to self-regulate their own learning, regulating their cognition, metacognition, motivation when engaged in e-learning.

The effects of self-regulated learning (SRL) on academic achievement have been supported by empirical evidence in traditional learning environments (Pintrich, 2004; Wolters, Pintrich, & Karabenick, 2005; Zimmerman, 2008). Empirical findings of SRL effects on academic learning in online environments provide some evidence of positive impacts on academic performance (Bell & Akroyd, 2006; Joo, Bong, & Choi, 2000; Lynch & Dembo, 2004; Wang & Newlin, 2002). However, research studies examining the relationship between self-regulation and creativity are scarce (Hargrove, 2007; Hong, Peng, & Wu, 2010).

Technology-integrated instruction that incorporates strategies for promoting students' self-regulated learning has been demonstrated as effective in student learning. For example, Dabbagh and Kitsantas (2005) found that different elements of Web-based pedagogical tools (WBPT) (e.g., collaborative and communication tools, content creation and delivery tools) support various self-regulated learning processes (e.g., self-monitoring) and that the tool is highly effective in activating the use of self-regulatory skills necessary to support specific types of learning tasks. In a Web-based technology course, students reported using various self-regulatory strategies, planning, organizing, monitoring, help seeking, and record-keeping (Whipp & Chiarelli, 2004). Cognitive tools for self-regulated e-learning, such as gStudy (Leacock & Nesbit, 2006), were developed to help students become better self-regulated learners in e-learning environments, showing positive influences on students' approaches to learning. Technology-integrated online learning environments afford differentiated guidance and support of student activities. Adaptive approaches such as different types and amounts of guidance for student self-regulation during online learning activities can be provided by, for example, prompting students to self-reflect to monitor their understanding or to facilitate progression toward task completion by reminding students of deadlines (Davis & Linn 2000; Liu, Bonk, Magjuka, Lee, & Su, 2005).

Likewise, self-regulated leaners tend to have higher motivation manifested by their persistence when they encounter learning difficulties, understanding the usefulness of tasks, enjoying tasks, and demonstrating high self-efficacy (Eccles & Wigfield, 1995; Schunk, 2005). Students' motivational beliefs about learning and their effects on the use of self-regulated learning strategies and academic achievement evidenced

in the traditional classroom environment have also been evidenced to be as effective for online learning (Artino & Stephens, 2009; Hsu, 1997; Joo et al., 2000; Whipp & Chiareli, 2004). Not surprisingly, technology, or Internet, self-efficacy contributes to the effective use of technology (Peng, Tsai, & Wu, 2006) and is important for success in online learning (Joo et al., 2000; Schrum & Hong, 2002; Wang & Newlin, 2002). These findings indicate that ensuring all learners become competent with the Internet and technology tools is an important aspect for successful online learning. Digital Natives would have no or less resistance to learning new technologies necessary for online learning.

Goal-setting by e-learners positively affects their performance (Curry, Haderlie, & Ku, 1999; Schrum & Hong, 2002; Whipp & Chiarelli, 2001) and self-regulated learning (Azevedo, Ragan, Cromley, & Pritchett, 2003). When teacher-set goals and learner-generated goals in instructional conditions were compared in their effects on self-regulation, students in the latter condition were significantly better at regulating their learning by planning and monitoring their learning and by creating sub-goals, activating prior knowledge, and engaging in adaptive help-seeking (Azevedo et al., 2003). These findings indicate that learner control afforded by a technology-integrated learning environment enhances self-regulated learning as well as motivation. It has also been observed that learners have difficulties deploying self-regulatory skills while learning complex topics in technology-integrated learning environments (e.g., complex science topics in hypermedia environment). Azevedo (2005) illustrates how self-regulated learning can be used as a guiding theoretical framework to examine learning with hypermedia and proposed several methods for facilitating students' self-regulated learning of complex and challenging science topics.

Technology-integrated educational programs can enhance students' regulation of motivation to learn by prompting them to persist when encountering learning difficulties, to set realistic goals, and by promoting self-efficacy through the provision of timely feedback (Bandura, 1997; Locke & Latham, 1990). Barak (2010) advocates that self-regulated learning should be integrated in technology education, highlighting the interrelationships among cognitive, metacognitive, and motivational aspects of problem-solving and creativity. Online problem-based learning activities can help student see the relevance of task, increasing the perceived value of what they are learning (Bransford, Brown, & Cocking, 2000; Liu, 2004; Woo & Reeves, 2007).

Although the utilization of these instructional strategies have been encouraged for online learning (Bangert, 2004; Dabbagh & Kitsantas, 2004; Wang & Lin, 2007), we have not seen yet the programs that fully implement these strategies. In addition, research studies that investigate the effect of Web-based technology on student creativity are rather scarce. For example, Jang (2009) explored secondary students' creativity in a science curriculum by integrating Web-based technology. With real-life scientific materials used to stimulate creativity in the Web-learning environment, students' scientific creativity was enhanced. Although there are

pockets of researchers who tested the effects of technology-integrated self-regulated learning, what is currently lacking is the integrated approach to the design and development of curricular and instructional materials on a large scale. As Web tools have become more wide-spread and many schools and universities have begun to make institutional transitions to online learning, instructional developers should attempt to create online-based materials that incorporate evidence-based learning and motivation theories.

## CREATIVITY EDUCATION IN THE 21ST CENTURY

Creativity in education is lacking in the United States. Kao's (2011) essay, "Are we still an innovation nation?" indicates that the U.S. capacity for innovation is eroding while other countries such as Sweden, China, Australia, Canada, and Singapore, are ramping up innovation efforts and spending enormous amounts of money to provide new incentives and to nurture talent for supporting innovation initiatives. While there has been research on creativity in the field for decades in the U.S., it has not been embraced in the classroom as well as in various work domains. There are, however, promising signs that creativity in education is gaining attention and value. "The Creativity Crisis" described in the July 19, 2010 issue of *Newsweek* (Bronson & Merryman, 2010) attracted massive attention to the long-ignored issue of creativity (Kim, 2011).

The educational and research focus on Science, Technology, Engineering, and Mathematics (STEM) has led to many school hours being assigned to these subject areas (Britt, 2010). Unfortunately, there is the perception that creativity may not play a role in teaching and learning STEM subjects. In fact, innovation and STEM education are closely tied to the economic success of the country (Britt, 2010). President Obama launched his "Educate to Innovate" campaign on November 23, 2009 as a partnership with organizations to increase the focus on STEM education in innovation (Office of the Press Secretary, 2009). The *Race to the Top* and *Investing in Innovation* (i3) initiatives sponsored by the U.S. Department of Education, are designed to increase creative thinking in the classroom in support of the president's call for greater emphasis on innovation in schools (Robelen, 2011). The Race to the Top program signed by President Obama February 17, 2009, offers, in part, high-dollar grants to schools willing to bring creativity to the classroom, especially in STEM subject areas (U.S. Department of Education, 2009b, 2010a). Unfortunately, the area gaining the most attention has been test scores and how scores are used for educational policy. Koretz (2009) indicated that the emphasis on test-based accountability is a weakness in the American education system. Eventually, the U.S. Secretary of Education, Arne Duncan, testified to Congress in March 2011 that 80% of schools in the U.S. cannot meet the goals of test-based accountability (Usher, 2011).

The U.S. Department of Education launched the second phase of the i3 program in early June 2011, making $650 million in grant funding available for innovative

programs in American schools (Brenchley, 2011). The goals of these programs are tied closely to technological innovation and to developing future talents. Investing in innovation is part of the American Recovery and Reinvestment Act of 2009 to support local schools to introduce, or further develop, innovative programs (U.S. Department of Education, 2009b). These programs are dedicated to school reform, innovation being a large part of that reform. It is good news for U.S. schools that the country is now taking note of the importance of creativity and is supporting creativity and innovation with funding. The increasing focus on creativity and innovation was also evidenced by the efforts of states in moving away from the test-based accountability. Early August 2011, Arne Duncan announced that states may request waivers to the *No Child Left Behind Act* to afford schools more flexibility in reaching higher performance levels in education (Bruce, 2011). As of September 1, 2011, four states have been approved for waivers, four states have submitted requests, and sixteen states have indicated they will do so (Center on Education Policy, 2011). Only two months later, as of November 18, 2011, the number of letters of intent to file had grown to 39 states, Washington D.C., and Puerto Rico (Center on Education Policy, 2011).

Other nations have not been as slow to catch on to the need for creativity in the classroom. There have been a number of initiatives worth mentioning. A good example is the *European Union Year of Creativity 2009*, which was introduced for the economic, social, and personal well-being of the citizens of the European Union (EU) (European Year of Creativity and Innovation 2009, 2009). The EU published *The Manifesto* which includes Provision 1, "Nurture creativity in a lifelong process where theory and practice go hand in hand" and Provision 2, "Make schools and universities places where students and teachers engage in creative thinking and learning by doing" (European Ambassadors for Creativity and Innovation, 2009, p. 2). The target audience was young people and educators, with the long-term goal of developing lifelong learning in the European community. Education, formal and informal, is included in the program, as well as artistic and non-artistic creativity. The goals covered all these areas, culminating in an international conference dedicated to these goals. The programs were for 2009, but they continue to carry over into subsequent years (European Ambassadors for Creativity and Innovation, 2009). For example, the Association for Teacher Education in Europe carried forward the theme of the 2009 European Year in their 2011 Spring Conference. The agenda was dedicated to examining current education policies in light of creativity and problem solving (ATEE, 2011).

Another example is the national program to bring creativity to schools in the United Kingdom (UK) (Thompson, 2009), which was a predecessor to the EU program. Economic concerns have been a driving force for the national program for creativity in schools in the UK. The UK implemented a national program to bring creativity into the classroom beginning in 2002, with emphasis on investment in human capital. Fears of economic decline on a national scale provided the impetus, simply put, "creativity is identified as a key disposition for learners operating in

the knowledge economy" (Thompson, 2009, p. 39). The "Creative Partnerships" program introduced in 2003 in the UK was one approach to foster creativity in the everyday classroom. Recognized artists, from a number of fields, were hired to work with students (Hall, Thomson, & Russell, 2007). Art (portraits), writing, and dance were included in the elementary schools under the guidance of artists, not educators. The teacher was present but allowed the artist to be responsible for the pedagogy. Hall and her colleagues (2007) found that the most effective strategy is a partnership with the teacher and the artist, finding that the program helped students explore talents and self-expression.

As individuals and various cultures use the open source of Web knowledge and the tools of the Internet to develop and share creative ideas and products, it is rather natural to recommend the utilization of technologies and tools to enable creativity in school as well as out of school. The point is that these are the very tools used by today's students in their non-academic lives anyway. If students are not encouraged to be creative and are not taught creative thinking skills, they can easily fall behind in this age. It is about time that schools utilize Web tools and technology for instruction and learning.

## CREATIVITY IN THE CLASSROOM

Incorporating creativity in school curricula is essential for students' life success. The economy demands creativity, which creates a wealthier society, which, in turn, creates individual assets (Craft, 2003). Maslow (1970) suggested that creativity is not only for a few people whose creative talent will reach a profound level, such as Einstein, but is manifested in the everyday activities of everyday people. Maslow's 'a more widespread kind of creativeness' (p. 159) now can be further encouraged in this age as the Internet and Web tools make it possible for everyday people and everyday activities, in classrooms and out-of-classrooms to process their creative thoughts and to publish their creative products.

As we have seen, students today tend to be creative in their non-academic lives. They are using technology, are creating, and are sharing (Greenhow et al., 2009; Prensky, 2001; Siemens, 2006a). Students are on line, interactive, and engaged with each other and with the world at an ever increasing level (Levin & Arafeh, 2010). One may suppose that it would be an easy transition to bring these skills into the classroom; yet, this has not been the case in regard to utilizing the technologies for creative purposes. Teachers' level of technology knowledge and skills is one obstacle to realizing this transition, and the demand to 'cover' the curriculum is another. Teachers in typical schools seem more oriented towards avoiding the potential invalid or irrelevant knowledge gathered online (Anderson & Rainie, 2010) rather than towards facilitating creative engagment with the Internet and the variety of Web tools. Although the concern of teachers is understood, the more pertinent reason for under-utilized creative technology tools may be that there is a "digital disconnect" between the student and the teacher that needs to be overcome

(Greenhow et al., 2009). Learning, rather than simple information gathering, comes from the interaction of the student with an instructor and others that should be embedded in the learning environment (Downes, 2006).

Educators are responsible to bring creativity in the classroom. Foremost, they should realize that most students are already using the tools of technology to be creative, although these are not utilized for learning and may not be necessarily beneficial to learning (Greenhow et al., 2009). Some research indicates that the use of technology among adolescents is not as sophisticated as is assumed, and there is a wide spectrum of use, with the social networking tools being utilized the most; however, there is a growing group of young Internet users who do innovate and create with the Web 2.0 tools easily access (Bennett & Maton, 2010). It is an opportune time to conduct research into young people's use of technology and how it fits into education rather than focus on what the digital native is doing in their free time (Bennett & Maton, 2010) in an effort to determine how educators can bring the activities of the digital native into the classroom for creative uses to increase students' creative thinking and creativity and achieve academic goals. Combining Web technologies with learning and creative activities, providing individual and collaborative learning environments, seem logical as well as creative for students as they prepare to achieve their educational and professional goals over their lifetimes.

## CONCLUSIONS

Connectivism is a new learning theory for the digital age (Siemens, 2006a). Connections between student and information, student and student, and student and teacher are all part of the learning process. Research on the implementation of connections to the World Wide Web in the classroom is needed as we continue to help the digital native learn and create. New Web tools are created daily and students are learning as quickly as new tools appear and are put to use in creative endeavors. It is important for teachers to learn and utilize the tools in class, but it is also very important that research studies be conducted to determine useful tools and effective ways of using these tools for what subjects and under what circumstances.

The role and responsibility of teachers in the e-learning environment are not the same as those of traditional classrooms where teachers have face-to-face interactions and student behaviors are directly observable. Although teachers are expected to assume additional responsibilities, many of them are likely not ready to perform them. Whereas more students are beginning to learn through distance education, teacher training is not sufficient for teachers to fulfill their responsibilities in such learning environments. Clark and Zane (2005) indicates that whereas about 50% of teachers had technology training for use in the classroom in 2005, only 1% of teachers were trained for online teaching. Furthermore, teachers now have classroom full of digital natives who learn and create knowledge by using Web tools and hand-held gadgets. At the same time, students in general are found to be uncritical users of Web information, requiring guidelines so that students can become critical users

of Web resources (Zhang & Duke, 2011). Teacher training is sorely needed to update teachers with new knowledge and skills that students are very familiar with, so they can supervise and facilitate student learning through the vastly available information and tools in the Internet world. Even teaching in the area of design and technology requires modernization, as it faces the problem of old teachers, old workshops, and outdated projects (Dyson, 2011).

The good news is that some educational researchers are aware of the issues and have been focusing on developing the needed technological pedagogical content knowledge framework (Abbitt, 2011; Chai, Koh, & Tsai, 2010). However, beyond studying the technological content knowledge, teachers and teacher candidates must be trained actively in technology skills and applications (Martinez, 2010). The problem is that creativity is taking a backseat in these efforts. In school cultures where students' creative behaviors are seen negatively by most teachers (Aljughaiman & Mowrer-Reynolds, 2005), where classroom teachers' qualification to enhance creativity have been doubted (Slabbert, 1994; Torrance & Safter, 1986), and where teachers' understanding of their own implicit theories of creativity is in need (Rutland & Barlex, 2008), it may be that the training of teachers should begin with the topic of creativity, along with technology integration in enhancing creativity. Teachers need to be creative to provide students with a creative ethos for enabling and fostering creativity in their classroom (Craft & Jeffrey, 2004), requiring teachers' reconceptualization of instructional strategies.

The increasing relevance and importance of creativity and innovation has been recognized as a key characteristic of the global economy, where creativity is viewed as a source for survival in the global competition of economic advancement (Florida, 2004, 2007; Hippel, 2005). Today, the World Wide Web and Web tools provide individuals and groups with space for creative power to grow, share, and advance. As discussed in this chapter, the availability of Web information and tools has been changing the way students learn and create knowledge, although extensive research studies are needed to provide stronger evidence of the relevance of Web information and tools to classroom learning. What the education field (current academic environment) needs at this point in time of rapid growth of information technology is consideration and reconsideration of the vision and mission of curriculum and instruction. Students are learning and creating without proper guidelines that could enhance learning and make their learning more relevant and useful. It is time that the reality of technology advancement that is influencing learning and creative processes be a factor for how teaching and learning should be viewed and organized. Any educational agencies that have not responded to this trend should take action before they fall further behind and become irrelevant.

**A word of caution.** The blind conformism to the existence of social networks occupied by business conglomerates, along with the proprietary hardware, create what has been called "cognitive capitalism" (Pasquinelli, 2010), or creative capitalism, pushing people to be creative for corporate profit, but not for other reasons. Yes, creativity plays a crucial role in the economy for creating jobs and

prosperity among the world's nations (Burnard, 2006). No, schools and teachers should not be agents that stifle creativity. As we advocate creativity and the use of technologies to enhance creative thinking and creativity, our children should be helped to create their own goals that are meaningful for their own future; who other than educators, beyond parents, are best positioned to handle this responsibility? Educators can help students actualize their potentials, lead their lives with aesthetic appreciation for creative work, and put forth effort to enhance freedom and human dignity.

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