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Torrance Journal
for Applied Creativity open

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Reem Khalid Zayied Almansory
"Amazing Animals"

mentor stretch persist
love design
Volume 2 (2020) originate open

Communicating creativity as delineated by E. Paul Torrance and others, and advocating for its application to classroom and educational experiences.

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Preface

By Joan Franklin Smutny, Editor

On behalf of the authors, graphic designer, editorial staff, and the Journal Advisory Board, I am pleased to introduce the second issue of the Torrance Journal for Applied Creativity.

The purpose of this journal is to foster greater communication among creatives of all kinds—teachers, researchers, industry innovators, artists, designers, engineers, business professionals, and more. Through diverse experiences and expertise, these authors have illuminated a fundamental challenge of our time. The world has a great need for creative ideas and innovations across a broad spectrum of fields. Yet our school system—held captive to standardized testing and a narrowing curriculum—are hindering the growth of these qualities in our students. The most creative learners often feel adrift and disengaged, and the loss of talent to these forces is real.

E. Paul Torrance, the great creativity pioneer who inspires this journal, keenly felt the struggles of students trapped in schools that alienate them from their own talents. His extraordinary writings and teaching models were a response to the stifling of creative talent he witnessed around him, and they continue to be relevant and adaptable today. The authors in this journal have used, adjusted, and expanded the work of Torrance in ways that would certainly have pleased him. They have pioneered practical responses to a restrictive education system and presented ideas to inspire alienated and detached youth.

In a variety of ways, the articles presented here address key questions about creativity in contemporary society. How can we open the door to the creative gifts within our students, mentees, and children during a time of rapid technological change when innovation and invention are sorely needed? What practices will enable us to cultivate these abilities and prepare them for the world they will step into as adults?

While society in general may still define creativity in terms of products invented or designed, these articles examine creative processes more broadly and how they can lead to new solutions and transformations. Certainly, products often result from creative and imaginative thinking, intuiting, and improvising. But on a larger level, young people need an education system that offers more depth and breadth, more choices in what and how they learn. As the authors show, designing structures that support creative expression is key. Posing questions that challenge them, encouraging them to use all their senses to take in and respond to the world, integrating subjects to help spark new connections, and allowing time and space for reflection sustain creative growth.

We hope you enjoy this second issue, and find within its pages new ideas, resources, and strategies that you can use or adapt to inspire creative achievement in your students, mentees, and children.

Outstanding creative achievement involves being different, testing known limits, attempting difficult jobs, making honest mistakes and responding to challenge.

—E. Paul Torrance

The Value of STEAM in Our Gifted Classrooms: Subject Integration Supercharged

by Susan Bermeo and Harry Roman

The principle goal of education in the schools should be creating men and women who are capable of doing new things, not simply repeating what other generations have done.

--- Jean Piaget

Framing the Situation

We have entered a post-GPA world, where grades are interesting, but not necessarily the reason why one gets hired. It takes much more than academic knowledge now to be successful on the job. It is never too early to teach our young gifted students about the skills needed, and the relevance of what they are learning.

Listen to what Google said (paraphrased) when asked several years ago what they look for in new hires:

We don't care what school you went to, what grades you received, or whether you went to a big 10 school or a small one. If you did not go to college, that is OK. We are looking for people who are life-long learners, team players, problem solvers, articulate and know how to get along with others.

Companies the world over value employees who understand both content and process. In the dynamic workplace today, corporate leaders know that process ultimately guides the corporation through the shoals of global competition, resulting in strategic value to the company. Ask seasoned employees in leadership roles what their jobs entail and you are likely to see how hard technical skills soon become less important than the so-called soft, interpersonal ones. Corporate leaders spend a great deal of time

- teaching about and connecting staff to missions and goals-explaining why they are important
- helping staff develop plans of action for success
- identifying key technologies to be implemented and leveraged
- guiding staff around and mediating constraints to success
- developing plans of action that weave together tactical and strategic actions
- providing key guidance about the metrics of decision-making
- coaching and counseling employees to improve their performance.



Grace Lee

Ultimately, it is not how much you know (content) that is important but rather what you can do (process) with what you know, and how fast and cheaply you can do it before your competition does. Leaders leverage their talents through project teams and working groups, and to do so requires mastery of interpersonal skills. If we want today's gifted children to become tomorrow's leaders, we must equip them to understand what is needed, with ample opportunities to develop the necessary skills in classroom activities. It is essential that our gifted students, tomorrow's leaders, also effectively be able to articulate this to the next generation of workers in their charge.

At first, gifted teachers may throw up their hands in frustration exclaiming how all this talk about job

skills somehow sullies and cheapens the grand beauty of academic achievement, subverting it to the money-making side of life. How could there be a logical connection to our beloved eight periods a day of learning? Aren't we about championing individual excellence? Don't we have strong academic standards to enable this?

Let us not forget that industry and business with its ability to create national wealth, reduce back-breaking farm labor, and provide the means for leisure time made schools possible in the first place about 140 years ago. What has changed is a shift in priorities in the workplace and the world. This will impact all students. Here is a quick look at the chronological waves in the development of business:

-Interchangeability of parts (*yesterday*)

-Labor saving equipment and appliances

-Assembly line automation—with discrete job functions and rapid/repetitive assembly

-System integration with emphasis on total product quality—an Internet based rewiring of the factory

-The rise of knowledge over data and information in the workplace

-Strategic processes (know-how) for global competitiveness (*today*).

Over the last 30 years, it became necessary for workers to integrate their skills, to think about the whole product being built, and to work and communicate with other workers. Foreign competition and computerization made this absolutely necessary. It is no coincidence that our school standards have become more intense, with suggestions about subject integration. It is very clear that subject integration will soon be the norm in schools, eventually forcing a complete re-design of the old and terribly stale 8-subject-a-day pizza-pie-slice academic day.

***STEM is not just a part of the curriculum for the gifted.
It is the curriculum!***

--Dr. Maurice Fisher, Publisher, Gifted Education Press

We write this paper to discuss how STEAM educational paradigms in the gifted classroom can not only enable subject integration, but “supercharge” it.



Jasmine Kim

The Virtues of a STEAM Based Education

As you read through this section, keep in mind the itemization of skills the business world will demand of the gifted students now in your class:

1. Logical and analytical abilities
2. Converting data and information into knowledge and new products
3. Presenting ideas and concepts
4. Good communication skills
5. Planning and implementation skills
6. Team player
7. Integrated problem solving
8. Learning efficiently.

These are clearly higher order thinking skills, emphasizing knowledge creation and manipulation over data analysis, all aimed at innovation in the marketplace. Information and knowledge enable innovation, but are not all that is needed to make it so. The human element—creativity, invention, teamwork, leadership and project management---is the transformative combination. Let us “dive into the weeds” to discuss how the STEAM paradigm gets our gifted students into the sweet spot of on-the-job leadership.

STEAM provides a step-wise, reproducible, standards based, process-driven approach to team-based problem solving. A typical 8-step process hierarchy that can guide gifted students might include:

- Identify the problem
- Perform research about the problem
- Develop potential creative solutions
- Select best solution
- Test solution against constraints
- Revise solution if necessary
- Finalize solution
- Present oral and written reports.

This process is not performed in isolation. Students must, in order to achieve a successful solution, work collaboratively. As we like to say in the classroom, “Four heads are better than one.” In the world of business, all this work would lead to launching the new products and sales for the company; and if the team did its job well, that new product would be an innovation in the marketplace and not just an invention.

STEAM educational paradigms naturally solve problems from an across-the-curriculum approach. In this regard, STEAM is quite unique in the academic day. Educational experts have a tough time determining where it should be placed—in the mainline of subjects, an encore program, or perhaps an elective. Perhaps a studio design course where recitation and practice are combined in an extended classroom setting (what architects do)? Is it possible to evaluate student competence here in a statistically relevant manner as, say, testing content in a math or English course; or maybe we should have a new metric that replaces/augments traditional testing? Since STEAM is a powerful school-to-work path, perhaps the educational community might benefit from how companies evaluate employee performance in this regard—see the eight skills itemized on page 3.

Revisit the process hierarchy above, especially the “test solution against constraints” step. Often, constraints are very much more than simply what kinds of technology will be used, what it will cost, and design details. The “A” in STEAM should identify and deal with the impact of the solution on the fabric of our culture, or in the case of world-wide product innovations, the fabric of civilization in general. STEAM demands that the solution matrix of an innovation become more complex and interrelated. Here is a listing of the envisioned constraints in a STEAM type educational approach, or impact analysis, all leading to a finalized new product:

- Technology
- Economy
- Engineering
- Society
- Environment
- Sustainability
- Legal
- Safety
- Regulatory
- Cultural

This is clearly a case of dependent variables interacting in complex and nonlinear ways. It thus highlights the necessity and importance of iterating to a solution, with failure as a natural course of investigations and analysis, and lots of feedback loops during team activities. Embracing failure in the classroom and in the psyches of gifted and talented students and their teachers is absolutely necessary. Everyone fails, necessitating the inclusion of erasers on the ends of pencils. It’s what you do with failure that defines your ability to succeed.

This reminds the authors of the old maxim that in the environmental world, everything is connected to everything else. Perhaps this is why the global warming debate is so hotly discussed. There likely is a plethora of dependent variables that are not as well understood as we would all like. This underscores that good product design is difficult and takes time. Just look at the problems we have today, probably a reflection of less than rigorous design techniques used in the past.

Throughout the conduct of team-based STEAM activities, there are powerful components that bear heavily on the “A” component of STEAM, such as, but not limited to

- Team member interactions and the tolerance of different member ideas and opinions
- Critique of ideas and proposed solutions, and not the person
- Oral and written presentation of ideas and points of discussion
- The keeping of team notebooks, and documentation of solution maturation
- Creativity techniques
- Deductive reasoning
- Lateral thinking.

Initially, this may present a challenge to your students. Traditionally, students have been expected to listen to the instructor to receive information. Each and every child in your classroom brings a lifetime of experience to the table. The diversity and richness of THEIR lives is a powerful learning mechanism. It has taken some time in our classroom to groom the children to share their experiences and listen to that of their peers. We have also witnessed a shift in our language arts instruction, which encourages this dialogue amongst peers and connections to real life experiences.

As we acquire new knowledge, we naturally try to incorporate this information, reconciling it with our existing knowledge. Consider the words below by the late Alvin Toffler, America's master futurist, who way back in the 1970s warned of the waves of change now crashing on our shores:

The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.

--Alvin Toffler

The world of business will become more like a university, necessitating workers to be flexible, in a constant state of "learning" and able to transform with the rapid change that will certainly surround them; and to comprehend interrelated and interdisciplinary complex business variables. Furthermore, these variables will be both "hard and soft," and technical and non-technical. This is the cusp of why experts today look to AI—the ability to use software to help humans ferret out what changes in data, information, and knowledge portend.

After attending a workshop, Linking Science and Literacy, given by Bill Badders at the NST Conference in Philadelphia in 2015, we learned that scientists spend about 70% of their work time, reading, writing, and communicating. We envision students as future scientists and give them ample opportunity to communicate with each other before, during, and after investigating activities.

No doubt the interactions and points discussed in this section are all life-long skills that can be universally applied—process skills that transcend the life cycle of learned content-based knowledge.

Forget Not the Bedrock of Learning—Question Asking

Asking questions is the basis of self-actualization and problem-solving in the gifted classroom. Are we spending enough time teaching our gifted charges how to ask high-quality questions—inquiries that help them and their team members to create real solutions to challenges that confront them? In a way, young folks can become very effective iconoclasts, challenging the status quo, and we must as teachers be brave to sit within "a classroom academic boiling water."

Is effective question-asking something we can track and evaluate to show the involvement and commitment of student learning? Do we understand how valuable the process of question-asking is for the future of gifted kids and their eventual transition to the world of business? Do we appreciate how this life-long skill is probably more important than the specific information and skills we teach them? Question-asking is what motivates us to fulfill our potential, to self-actualize.

What people think of as the moment of discovery is really the discovery of the question.

---Jonas Salk

Our responsibility in the gifted classroom is to help students appreciate and practice good question-asking. It should form the basis of the initial research phase of student/team investigations into project designs, team challenges, and classroom discussions; and most certainly later, when the student teams confront failures and uncertainties about handling design constraints, identifying contingencies and general project dynamics. Questions should permeate the STEAM classroom like oxygen in the air. Posing "What if" situations is a powerful way to get young minds percolating. Stimulating follow-up questions should be the aim of all gifted classroom discussions.

Student question-asking can be stimulated through a variety of avenues. Teachers can use these typical sources of information and others as motivators for young minds to wrap themselves around:

- Internet based searches
- Discussions with experts
- Newspaper articles
- Television/media sources
- Review of topically relevant papers
- Conference proceedings and journals
- Webinars
- Professional continuing education courses/seminars
- Business community commentary
- Entrepreneurs and new business launches
- Inventors
- Collegiate researchers
- Futurist oriented books and publications
- Education texts.

Suggested Classroom Activities

STEAM is a natural integrator of the curriculum, something of great value to gifted students who yearn to discover how their subjects interact and have relevancy. Here are some possible integrated curriculum activities to consider.

- What are the key industries that changed our world from the Civil War to now and how did these industries affect the lives of people?

- Thomas Edison had four really big inventions: recorded sound, motion pictures, light bulb and electric utility system, and R&D labs. How did these technological achievements change the world? What does Thomas Edison teach us about STEM and project teams?

- If our country decides to go completely renewable in its energy use (no more fossil fuels), what are the economic, technical, social, environmental, and cultural issues entailed in accomplishing this? Enhance answers with figures from diverse sources read and quoted by students.

- Develop a children's book about a topic of importance to current cultural discussions. How about a storyline for electric vehicles and their importance in saving oil use, reducing air pollution, clean and quiet operation, reduction in gasoline stations/petrochemical spills there and so forth?

- What would happen if through digital communications, people could work from home instead of driving daily to the office? Discuss these impacts (pros/cons/observations/commentary), such as but not limited to:

- Reduced traffic on highways
- People experiencing less face-to-face communications
- Changes in home energy use
- Less wear and tear on family cars
- Impact of power outages or communication outages at home
- Other?

- Bring the fun and natural excitement of science fiction into the classroom, for it has much to offer. Create a science fiction story about technical topics in the news (e.g., robots, life extension, artificial intelligence, and nanotechnology). The story can be humorous, ironic, or in other literary styles. Try it with poetry too. Consider these questions: What technologies do we take for granted today that were once science fiction thoughts or dreams? What great books were based on science fiction and why?

- How are engineers, entrepreneurs, and inventors a force for social good? Identify significant innovations that can be used as examples. For instance, how have Steve Jobs and Bill Gates improved our lives and made great changes in culture, society, and human interactions through their achievements in telecommunications and computers?

- As our homes developed and more infrastructure services were incorporated into them (e.g., potable water, sewerage, telephones, electricity, natural gas and so forth), how did this affect our standard of living and the social good of citizens around the world?

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Harry T. Roman is a retired engineer, teacher, inventor, and author. He has published over 600 articles, papers and scientific treatises, along with 75 teacher resource products including books, math card games, and science kits. A recipient of multiple awards for his outstanding service as an educator, as well as his pioneering technological achievements and inventions, Roman is currently an educational advisor for the Edison Innovation Foundation, and often visits local schools to work with teachers and students.

Let us think of education as the means of developing our greatest abilities, because in each of us there is a private hope and dream which, fulfilled, can be translated into benefit for everyone and greater strength for our nation.

- John F. Kennedy

Torrance's Model for Teaching that Encourages Incubation

by Bonnie L. Cramond

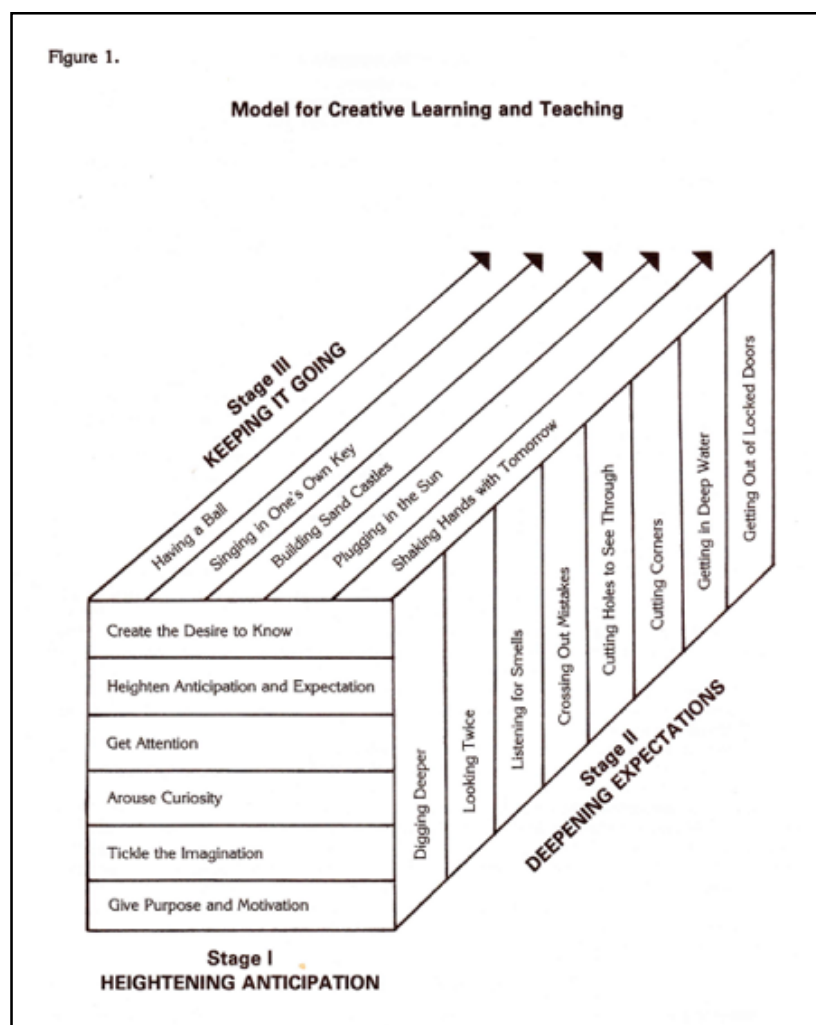
According to the story, *One Thousand and One Nights*, Scheherazade told the king a story every night but left it unfinished so that he would let her live another day to complete it. Novelists and screen writers have long used this strategy of storytelling, called a “cliff hanger,” both for television and movies to keep the audience coming back for more. In the meantime, a good cliff hanger makes the audience wonder how the dilemma will unfold and eager for more. Those old enough may remember the infamous shooting of J.R. Ewing in the television series, *Dallas*, and the intense speculation about who did it until the series started again.

Torrance determined that a similar technique would keep students thinking about a lesson long after it ended. The basic elements of a model were first conceived in 1966 when he was enlisted by Ginn and Company to help devise materials and methods for teachers that would accompany the publisher's textbooks (Torrance, 1969; 1970). The Incubation Model emphasized activities to encourage creativity before, during, and after a lesson (Hébert, Cramond, Neumeister, Millar, & Silvian, 2002). This differentiated it from other lesson structures that typically follow a sequence of *introduction - learning activities - closure* (see for example, Madeline Hunter, 1982). In contrast, The Incubation Model (Torrance & Safter, 1990) stresses methods for keeping students thinking after the lesson concludes. In order to ignite the creative process, Torrance believed it was important to get students to go beyond rational thinking by actively engaging their curiosity, intuition, and emotions.

Conceptualized as a cube, The Incubation Model as depicted in Figure 1 (Torrance & Safter, 1990), includes three sequential stages: 1) *Heightening Anticipation*; 2) *Deepening Expectations*; and 3) *Keeping it Going*. It is important to observe that the last stage has arrows to indicate that the thinking continues past the lesson.

Each stage incorporates several strategies for teachers to choose from in designing lessons. Because Torrance gave figurative descriptions rather than prescriptions for the strategies, it is up to teachers to create or adopt specific strategies that fit their own style of teaching, subject, and level. The Incubation Model book, written by Torrance and Safter (1990), includes exemplary lessons in different content areas and at different grade levels to show how some teachers have applied the different strategies. Some descriptions and ideas for employing them are provided below. See Figure 1, an image of the three-dimensional model as conceived by Torrance (Torrance & Safter, 1990, p.8).

Figure 1.



Stage 1: Heightening Anticipation

The purpose of this stage is to get students interested, motivated, and intrigued. There are six strategies that may be used at this stage, and each strategy may be used in different ways. The six basic strategies are: 1) *Create the desire to know*; 2) *Heighten anticipation and expectation*; 3) *Get attention*; 4) *Arouse curiosity*; 5) *Tickle the imagination*; and 6) *Give purpose and motivation*. There are many ways to do any of these. For example, in order to create the desire to know, a teacher could introduce a discrepant event to pique students' interest and curiosity. Suchman (1962) first wrote about using discrepant events in science education whereby students are presented with a puzzling phenomenon and encouraged to investigate it, hypothesize, and test their hypotheses to help explain the event.

A simple example might be to show young students how a strip of PH test paper can turn pink or blue depending on what substance it is dipped into. Why? What do the substances that turn the paper pink have in common? The substances that turn the paper blue? Can you hypothesize about other substances that would turn the paper pink or blue? Test your hypotheses. What can you generalize?

There are many such discrepant events in teaching materials and on the internet. For example, Cini (2018) explained several discrepant events for different science phenomena that can be demonstrated in the classroom with easily attainable materials. There are also videos and slide shows that illustrate such events (e.g., The Mystery Ruler, n.d.).

The same process works when teaching English or Social Studies with current events, as demonstrated by Takeshita (n.d.). In one of two examples, students observe two visuals: a bar graph showing the rate of Cesarean births in 18 countries, with the United States at the top; and an editorial cartoon illustrating the high cost of malpractice insurance in the U.S. Students then ask questions and gather information about these illustrations with the final result being hypotheses about the causes and effects that relate the two visuals. In the second example, students read an article, "Should a Wife Keep Her Name?"

These examples show that the discrepant event can appear in a number of forms: demonstration, experiment, video, slides, table, cartoon, article, and so forth. The content can include different subject areas. There are other ways to get students interested in a lesson:

1. Confronting ambiguities and uncertainties
2. Questioning to heighten expectation and anticipation
3. Creating awareness of a problem to be solved, a possible future need, or a difficulty to be faced
4. Building onto the learners' existing knowledge
5. Heightening concern about a problem or future need
6. Stimulating curiosity and desire to know
7. Making the strange familiar or the familiar strange
8. Freeing from inhibiting mind sets
9. Looking at the same information from different viewpoints
10. Questioning to make the learner think of information in new ways
11. Predicting from limited information
12. Making the purpose of the lesson clear, showing the connection between expected learning and present problems or future career
13. Providing only enough structure to give clues and direction
14. Taking the next step beyond what is known
15. Offering physical or bodily warm-up to the information to be presented (Torrance & Safter, 1990, p. 9).

The point is to intrigue students, or as Torrance said, heighten their anticipation. There are many ways, using different media, to do that.

Stage 2: Deepening Expectations

The second stage of the Incubation Model is Deepening Expectations. This is the stage during which the students' interest and learning is deepened. Torrance used metaphorical language to describe the processes at this stage. Those stages and their description can guide teachers in developing activities at this stage:

Digging deeper means looking beyond the information on the surface to find what is beneath it all. For example, using the discrepant event described above about Cesarean births in the U.S., why are there so many more in the U.S.? Investigation into this fact uncovers the information that in the U.S. the rate is higher, in

part, because once a woman has given birth via Cesarean, the incidence of subsequent births being by Cesarean is higher than in other countries. Why is that? Further investigation reveals that doctors prefer a Cesarean for a mother who has had it before due to the threat of a lawsuit if there is a problem. The high incidence of medical suits and the high cost of malpractice insurance impact the decision to deliver subsequent babies by Cesarean.

Looking twice means deferring judgement until one can consider all information carefully (i.e., not coming to a conclusion based upon the first impression). An example of this is having students listen to a poem several times before interpreting its meaning, or looking at a piece of art again to really see what is there.

Listening for smells uses the idea of synesthesia (the experience of a sensation by a sensory system other than the obvious one, such as using the sense of hearing to perceive an aroma). The point of this strategy is to encourage students to use all senses to learn about something.

Crossing out mistakes refers to encountering information and being able to recognize our mistaken beliefs and assumptions. When we are learning, we should be free to make assumptions, then disregard them; make hypotheses and disprove them; investigate leads and leave them when they prove fruitless; disconfirm long-held misconceptions, and so on. Students should feel encouraged and free to recognize and correct mistakes as an important way of learning. Mistakes that help us learn should be celebrated, not avoided. Helping students see many of the mistakes famous people made and disappointments they faced may help them realize that no one has a smooth path to success. A good idea might be to put up a display where students can add their experiences: A mistake I made, and what I learned.... The teacher might want to start the display.

Cutting holes to see through is the process of focusing on the most important information and discarding the rest. This involves the ability to synthesize and glean the most vital information from a learning experience. Again, going back to the example of the large number of Cesarean sections in the U.S., another piece of data is that the number is also high in Canada. Some conclusions may be that these are both English speaking countries, both former colonies of Great Britain, both on the continent of North America. But further research indicates that none of these factors is key to the number of Cesarean births. At this stage, students need to disconfirm evidence and hone in on the important factors. This is also a time for them to confront misconceptions, and there are many in all of the subject areas. These might also go up on a board in the class: What I thought, and what I now know...

Cutting corners involves making mental leaps to develop insights. This is harder to plan, but may be most useful in making a solution to a problem better or determining the best way to implement a solution. Sometimes in the creative process there are ways of knowing that defy rational processes. Students should feel encouraged to listen to these intuitions and explore their feasibility.

Getting in deep water allows digging into some issue beyond the available information, going beyond taboos, and getting so involved to a degree as to lose awareness of time and surroundings, as in Flow (Csikszentmihalyi, 2008). During this process, students explore outside the usual parameters of time, place, and extent of their chosen inquiry. They may stay after school, visit external places, or otherwise go beyond the boundaries of the classroom to investigate an issue.

Finally, *getting out of locked doors* requires "solving the unsolvable, going beyond those 'more and better of the same' solutions that make matters

worse, and opening up new vistas, new worlds" (Torrance & Safter, 1990, p. 10). This process requires that students exceed the ordinary methods of solving problems to come up with new and creative ideas. The process of Creative Problem Solving (Parnes, 1992) or its extension by Torrance into solving societal problems through research and creative thinking, Future Problem Solving (Torrance, Bruch, & Torrance, 1976; Future Problem Solving Program International, n.d.) can help students make this leap from learned solutions to known problems to new solutions to open-ended problems.

Stage 3: Keeping it Going

The real heart of the Incubation Model is this stage because this one emphasizes keeping the learning going after the lesson ends. There are five strategies suggested to accomplish this, but many ways to do each one. Again, Torrance expressed these as metaphors to emphasize the creativity and openness of the strategies.

Having a ball emphasizes humor, laughter, and fun. Humor is not often highlighted in teaching models, but students who enjoy an activity are likely to stay involved. There are many ways to infuse humor into the classroom—through games, jokes, silly costumes, parodies, and funny books. Students can draw comic strips to show a process or create editorial cartoons to express opinions. There are many resources for educational cartoons on the internet. Another way to ensure that students have fun is to form clubs around the content areas through which students can interact socially as well as academically.

Singing in one's own key addresses the personalization of learning. This strategy involves ways to help students find and develop their passions. It may include helping them create a science lab or art space at home, or showing them how to find publishers for their writing. Pressfield (2012) wrote,

"We are not born with unlimited choices... Our job in this lifetime is not to shape ourselves into some ideal that we imagine we ought to be, but to find out who we already are and become it" (p. 146). Looking at this from an education perspective, we might say that it is the job of teachers to help students find out who they already are and become it.

Building sandcastles includes strategies to help students imagine, fantasize, and search for the ideal in a situation. Through activities, students learn to imagine the ideal, recognize the real, and work toward closing the gap. For example: What would the ideal classroom look like? How can we work to make our classroom more like that? Immediately? Over the next few weeks? Months?

Plugging in the sun is the strategy that emphasizes hard work and finding and using resources. It is not enough to have fun, find one's passion, and imagine the possibilities, one must have the energy and resources to realize the ideas and operationalize them.

Shaking hands with tomorrow includes activities to help students develop a future vision. The point of these strategies is to have students recognize issues of the future that they can work on now to become involved citizens of the world. Torrance's Future Problem Solving Program (Torrance, Bruch, & Torrance, 1976) is an excellent example of the kind of activity that can help students do this. This program has grown into an international program with competitions and resources for students in different categories and for different age groups. Teachers who do not want to form competitive teams, can still apply the process through Action Based Problem Solving (FPSPI, n.d.), or just use the structure to address problems that naturally occur in the curriculum. What should we do about waste in space? In the oceans? What might be some effective ways to address the problems immigrants face? Through the 6-step process, introduced under step 2 above, teachers can guide students to find new solutions to current and future problems in the world, the community, or school:

1. Identify challenges in the situation.
2. Select an underlying problem and word it for attack.
3. Produce solution ideas
4. Generate and select criteria
5. Evaluate the solutions to pick the best one
6. Develop an action plan.

Putting it all together

Perhaps the best way to exemplify how the Incubation Model works is to use a simple example lesson:

- **Grades:** 3-5
- **Topic:** Literature
- **Content Goal:** Introduction to elements of a story
- **Creativity Goal:** Producing Many Alternatives
 - Learning about character
 - Learning about setting
 - Learning about plot

BEFORE

The teacher shows the YouTube video *Can you solve this mystery?* (<https://www.youtube.com/watch?v=spvux3FXPtK>)

Through the YouTube, the class begins the discussion of mysteries, clues, and finding solutions.

DURING

1. The teacher reads one of the detective adventure books, *Encyclopedia Brown*, to students, leaving out the solution offered at the end of the story.
2. Students brainstorm in small groups possible solutions to the mysteries in the book.

KEEPING IT GOING

1. Have groups of students share their solutions with one another.
2. Then, read the end of the *Encyclopedia Brown* story.
3. Guide the class in examining how characters, settings, and plot were designed to help solve the mystery or lead the reader astray. (Introduce the term “red herring.”)
4. “Can you write your own story with a mystery that the class will have trouble solving?”

Conclusion

Although many people think of E. Paul Torrance in terms of his eponymous tests of creative thinking, he was proudest of his work to develop the creativity of students. He had optimistic faith in the abilities of teachers to foment creativity in their students, and in the students to create a better world.

His Incubation Model is structured, but not prescriptive. Teachers can choose to use one or more strategies from each stage in designing a lesson, whether it be a short lesson or one to last over several months. The Incubation Model enables educators to teach students to think creatively while learning content and to infuse creativity into their lessons rather than design piecemeal activities (Hines, Catalana, & Anderson, 2019). Individuals who need further guidance in using this model can look at the examples in the Torrance and Safter (1990) book and browse the resources available online, some of which are listed at the end of this article. As long as one keeps the spirit of igniting and nurturing the creative spark, it is hard to go wrong.

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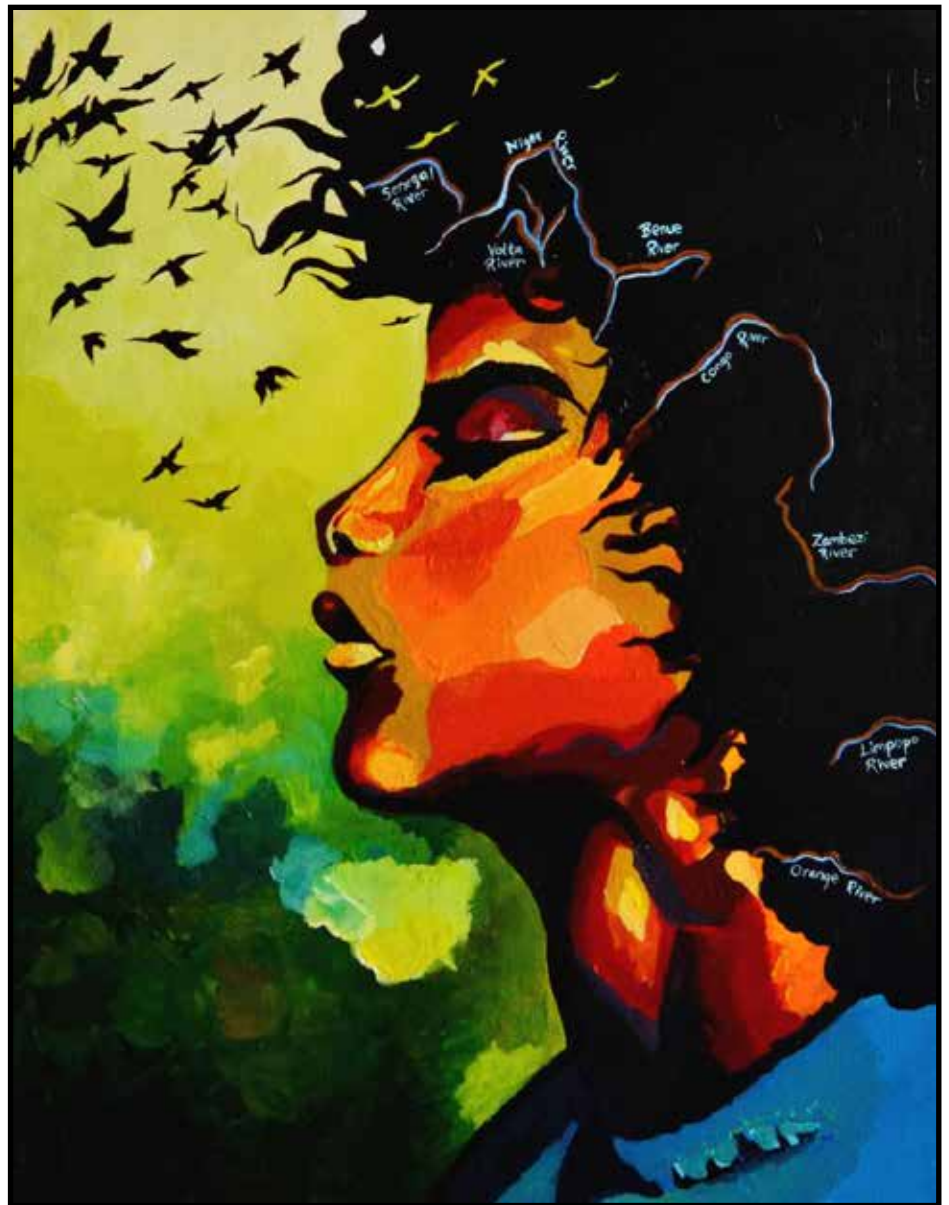
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Ivana del Piologo



Creativity in the Business World

by Patrick Forman

Business leaders at all levels of the economy are looking to innovation as a key driver of their growth. Innovation can come at various levels of impact, from creating brand new products to making incremental improvements to better serve customers. Most business leaders believe that without innovation, their potential to grow and even survive will diminish. So how can people entering the workforce prepare themselves for this demand for innovation?

Innovation does not happen in a vacuum. While a business enterprise can provide critical supports for it, the ultimate engine of innovation comes from the creative potential of human beings. People typically enter the workforce after 12 to 20 years of formal schooling, and the education process will have a tremendous impact on their ability to harness and improve their natural creativity.

Many educators are highly interested in fostering creativity in their students. My observation is that knowing how business leaders define and enable creativity helps teachers prepare students, as well as enhance their enjoyment in the process. The methods that educators use to support the creative process closely align with those that businesses use. There is a higher level of innovation that I will discuss in this article. I will also help define how business leaders think about creativity and explicitly try to encourage it within their own enterprises.

Three-Pronged Structure

When business leaders discuss creativity, they mean something different than unstructured brainstorming. The creativity a person brings to an enterprise has to be directed to the benefits that the enterprise offers along three dimensions. These offerings represent the investments that a business enterprise makes to take advantage of creative insights and innovation of the people they employ.

First, there is the dimension of *physical support*. This means that the enterprise has made investments in tools, equipment, and technical infrastructure to enable creative work to positively impact the business.

Second, there is the dimension of *research support*. It is extremely inefficient to expect people to learn, analyze, and keep up-to-date on every development in every field, so enterprises generally invest in some level of research that their people can take advantage of when they need it.

Finally, there is the *dimension of organizational support*. When a business enterprise hires someone and expects creative effort, there has to be some formalized plan for utilizing this effort. This means an organization that expects and can use the output of people's creativity.

While this three-pronged structure is common in business, it should not come as a surprise to educators who are trying to support creative endeavors. Educators enable their students' creativity with tools and equipment. They provide a base of knowledge and research to get the creative process started. And as the students create, their teachers provide an outlet for their creativity to be enjoyed and used by others.

For example, imagine a teacher of creative writing at the junior high school level. The physical supports necessary are pretty simple – perhaps a laptop with a word processing application, or access to Google Docs, or even just pen and paper. Certainly, every teacher of creative writing will expose their students to other examples of creative writing as a form of preparation. In other words, students of creative writing will have a baseline of reading as a catalyst to the creative process – this represents the dimension of research support. Finally, there is some organizational structure in place to deliver the value of the work produced, such as a school literary journal. After all, what good is a work of creative writing without a reader?

This same pattern applies to other creative endeavors. Creativity tends to be a process that blossoms as the baseline understanding of the subject matter grows. Think about artists, for example, who start mixing their own paints, or musicians who modify and tune their own instruments. Being able to challenge the status quo from an educated perspective can be very powerful.

Once people understand how creativity is supported, they start to question what supports they actually need and how to improve the process. The questions people can then ask themselves include: Do we have the right tools here? Do we know about the subject and have we seen the prior art? And do we understand how the fruits of our creativity are going to be used? I sometimes think of the innovative process as a machine waiting for its fuel, human creativity. Rethinking and redesigning that machine can power creativity to incredible heights.

It can be a useful exercise to pose these questions to students as they work through any creative process. High school ceramics students, for example, could learn new tools and methods for throwing and glazing pottery, and could explore the evolution of pottery and what led artists to the choices they made. The key is getting to the point where students can *challenge* the tools they have and the current understanding of the state of the art, not from a position of ignorance but a position of wanting to create something new.

A Bicycle for the Mind

The highest form of creativity people can bring to an enterprise is introducing a new way of using resources to bring new value to those around them. The business enterprise can and should provide the supports I have detailed above, and within that framework true innovation can blossom. Business leaders highly value people who can express that challenge, not as a rejection of how they currently work, since that would require negating the investments they have already made, but rather as a new way of doing things that is fundamentally better.

The classic example is the metaphor that Steve Jobs brought to computer technology. Most people in that industry thought of computers as highly specialized tools that were endlessly configurable and required significant training to use. Steve Jobs famously said instead that he wanted a computer that was like a bicycle for your mind – intuitive, easy to use, and unforgettable once mastered. Of course, he built an enterprise to drive that innovation, built on the vast knowledge of computer technology that he and his collaborators already had. Apple is still innovating, providing the tools, research, and organizational structure required to harness the creative power that it continuously recruits new talent to bring to its organization.

As a business leader myself, I am always interested in the creativity of people who can challenge my current understanding of how best to serve our customers. The ideal kind of creativity is one which—like that of Steve Jobs—depends on a thorough understanding of the subject matter and proves its usefulness in significant ways. Innovators who know their field and are ready to express what they need to be creative as well as how an enterprise can apply their ideas will be successful. I believe that these criteria can help educators prepare people to be creative and actually see the fruits of that creativity serve others.

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This article represents only the opinions of Patrick Forman and is not endorsed by Vlocity, Inc.



Campbell Keadon

Suprarational Stars: Torrance's Beyonders

by Sarah E. Sumners

"...test scores are insufficient to predict those who have gone beyond the accomplishments of their peers, beyond what the quantified measures could predict, beyond anyone's wildest dreams, but theirs."

-E. Paul Torrance (1993, p. 9)

The Manifesto: A Guide to Developing a Creative Career (Torrance, 2002) serves as E. Paul Torrance's reflection on creativity based on his influential longitudinal studies of creative talent. Upon becoming the Director of the Bureau of Educational Research at the University of Minnesota in 1958, Torrance was charged with undertaking longitudinal research into the education of gifted children. From 1958-1964 Torrance focused on studying creative talent through the administration of various creativity measures, achievement and IQ tests, and sociometric surveys for all elementary grade (1st -6th) children at two local Minneapolis schools as well as all 7th -12th graders at the University of Minnesota High School. Successive follow-up data garnered from surveys of demographics and creative achievements, aspirations, and accomplishments were collected from the high school participants at 7-year (Torrance, 1969), 12-year (Torrance, 1972a, 1972b), and 30-year intervals (Torrance, 2004).

The 22-year (Torrance, 1981), 40-year (Cramond, Matthews-Morgan, Bandalos, & Zuo, 2005), and 50-year (Runco, Millar, Acar, & Cramond, 2011) follow-up studies conducted with elementary school children validated the use of creativity measures and IQ for predicting fruitful creative production in adulthood. However, Torrance was more interested in the personal, environmental, and experiential factors transcending rational boundaries and impacting the individual's creative

production throughout life. He came to this realization after analyzing data from the 22-year follow-up study, and formed a set of guiding principles for children to maximize their creative gifts throughout their lives. The resulting publication of the *Manifesto for Children* (Torrance, Presbury, & Henderson, 1983) summarizes the guidance offered by the children in the study.

1. *Don't be afraid to fall in love with something and pursue it with intensity.*

2. *Know, understand, take pride in, practice, develop, exploit, and enjoy your greatest strengths.*

3. *Learn to free yourself from the expectations of others and to walk away from the games they impose on you. Free yourself to play your own game.*

4. *Find a great teacher or mentor who will help you.*

5. *Don't waste energy trying to be well-rounded.*

6. *Do what you love and can do well.*

7. *Learn the skills of interdependence and give freely of the infinity of your creativity.*

The Beyonders

Identified as the top 10 individuals with the largest number of creative achievements between the 12-year and 30-year follow-up timepoints, the "Beyonders" and their skills stand in stark contrast to the "Sociometric Stars," those rated most creative by their peers in 1958. After analyzing the data from the 30-year follow-up study of high school students, Torrance identified the ability to free oneself from the expectations of others and to walk away from the games they impose as an essential skill to becoming a Beyonder. Amassing a large number of creative achievements including hundreds of books, articles, inventions, patents, films, and artistic masterpieces, the Beyonders radically exceeded that of the Sociometric Stars in terms of their creative achievements. In essence, the Beyonders differed from the Sociometric Stars because they were able to escape the expectations of others and write their own rules for the game of life.

However, Torrance realized that the dominant factors (outside the realm of achievement, intelligence, or creative ability) at work in the lives of the Beyonders were motivational, emotional, and suprarational in nature. Such factors transcend rational thought and are critical to the generation and production of original ideas (Torrance & Safter, 1999). To further explore and define factors that made the Beyonders suprarational stars, Torrance (1991) developed the 35 item *Beyonders Checklist*, which he

based on the biographies of those with a high degree of creative achievements from the 30-year follow-up study and throughout history. But before continuing our discussion, we must first venture to better understand our own creative behavior. Now is the time to stop reading and boldly endeavor to complete the *Beyonder Checklist* below. Place a check mark next to any statement that describes your usual behavior, making sure to be as objective and honest as possible.

BEYONDER CHECKLIST (Torrance, 2002, pp. 127-129)

Please check the statements that usually describe your feelings.

1. I have experienced many ups and downs. _____
2. My behavior is difficult to predict. _____
3. My horoscope hardly ever predicts my behavior. _____
4. Even as a baby I knew I was no ordinary child. _____
5. I feel that I have an important mission in life. _____
6. I usually go Beyond the usual scope in trying to understand things. _____
7. I sometimes wonder why I have so much good luck. _____
8. I usually consider myself a giver rather than a taker. _____
9. I am not a well-round person; there are many rather ordinary things I cannot do. _____
10. I will repay a debt even when I do not have to. _____
11. When I have failed, I have picked myself up and tried again. _____
12. I am honest even when it hurts. _____
13. I love all living creatures. _____
14. I try to use my energy constructively. _____
15. I may fail a hundred times but I will not give up if I love it and believe in it. _____
16. I learn much from the experiences of others. _____
17. I like a challenge even though I have to work hard. _____
18. I enjoy being with young children or working with them. _____
19. At times I have felt very alone. _____
20. I look forward to retirement as my "golden years." _____
21. There are few people who have loved their work as I have. _____
22. Few people in my field have had the courage that I have. _____
23. I believe that the most important mission in life is give without end. _____
24. I have always had a high energy level. _____
25. My job is better than working for a living. _____
26. I have outbursts of levity occasionally. _____
27. When I am in doubt, I will often go ahead and try it. _____
28. My behavior is guided by a clear purpose. _____
29. I feel comfortable in being a minority of one. _____
30. Even as a child I knew I was different. _____
31. I am usually a chance taker. _____
32. It is fun to discover the reason behind things. _____
33. Problems or new ideas won't go away for me. They creep into my mind at odd times. _____
34. I find that I usually make a lot of mistakes in order to accomplish much. _____
35. Deep Thinking is real fun—more fun than much of the social conversation I get involved in. _____

Now, let us turn our attention back to the task at hand. What does it mean to go beyond? How do we encourage the children and adults in our lives to think beyond the typical? How do we embolden children and adults to exceed that of their peers and to push the boundaries of rational thought? Evidence from Torrance's follow-up studies point us toward dominant forces at play in the lives of Beyonders well outside the realm of achievement, intelligence, or creative ability. The Beyonders are creative outliers in that they exemplify characteristics such as persistence, courage, tolerance of mistakes, comfortability as a minority of one, not being well rounded, diversity of experience, and others that push them beyond the boundaries of their peers. In an effort to further refine the Beyond variables, Torrance (1991) validated the *Beyond Checklist* by submitting it to a group of Beyonders and a general population of superior adults. The following top ten items from the *Beyond Checklist* form the basis for the development of the *Manifesto for Adults* (Torrance & Millar, 2001), intended to encourage adults to make the creative leap and go beyond where others have gone before:

1. Delight in deep thinking,
2. Tolerance of mistakes,
3. Love of one's work,
4. Clear purpose,
5. Enjoying one's work,
6. Feeling comfortable as a minority of one,
7. Being different,
8. Not being well-rounded,
9. Sense of mission, and
10. Courage to be creative.

A common theme born out of Torrance's longitudinal research and reflected in the *Manifesto for Children*, the *Beyond Checklist*, and the *Manifesto for Adults* is that of dissatisfaction with the banal, the usual, the unoriginal. As children, the Beyonders successfully withstood the pressure to conform to the expectations of their parents, teachers, and peers. Their ideas were different, suprarational, yet they were

comfortable in their own uniqueness. As adults, the Beyonders were comfortable as a minority of one, celebrating their differentness, their unusualness, their originality.

If our goal is to encourage the children and adults in our lives to think beyond the typical, the rational, and to consistently produce original ideas, we must respect such divergency, show appreciation for its usefulness, and provide time to practice without evaluation (Torrance & Safter, 1999). It is only then that we teach others to push Beyond, to experience the awesome quality that comes with being different, and to stand out and feel confident and comfortable as a minority of one. "In fact, life's most energizing and exciting moments occur in the split seconds when our strugglings and searchings are suddenly transformed into the dazzling aura of the profoundly new" (Torrance, 1995, p. 131).

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Science Fiction in the Gifted and Talented Classroom: Connecting Science, Technology and Literature

by Harry T. Roman

Any sufficiently advanced technology is indistinguishable from magic.

--Arthur C. Clarke

Introduction

Joseph Engelberger, the father of modern robotics, clearly admits that Isaac Asimov's science fiction (SF) novels about intelligent robots inspired his interest in robotics technology. Look at how robots have influenced our automated factories, been used to explore planets, and performed hazardous duty here on earth. One of the greatest national design competitions for our youth involves the application of robots. Science fiction certainly has the power to influence hearts, minds, careers, and imagination. This is beyond doubt.

Truth be told, many scientists and engineers remain devotees of the science fiction genre. Some write it as well. Many incredible ideas, inventions, and disruptive changes were born in the pages of science fiction stories.

Science fiction does something else we intellectually applaud, but seldom really implement as much as we should: it integrates the curriculum. Science fiction takes technological advances, real or imagined, and explores how it affects the social, economic, technological, environmental, legal and cultural aspects of a civilization. Why wouldn't we want our gifted and talented youth to drink freely of this literary elixir? It seems like a no-brainer in teaching our youth about the grownup world of multi-dimensional problem solving and multi-disciplinary thinking.

The Benefits/Characteristics of Science Fiction [SF]

Let's take a quick look at the benefits/chief characteristics of science fiction—food for thought about using this literary genre with your gifted and talented students. This list is not presented in a ranked or prioritized format, but a recitation of how I see this potentially creative and exciting educational tool.

- 1) SF is the only literary genre that systematically examines the inter-relationship of science, technology, society, history, exploring future possible scenarios and cultural impacts.
- 2) This inter-disciplinary look at the world is exactly what is now being encouraged in school curricula and standards, like those encountered in STEM, technology education, and engineering design.
- 3) The science fiction theme is a naturally popular one, likely to draw interest from young students who generally warm up to the topic of futurism. Youth wants to think broadly; and this is a nice match for STEM-related studies.
- 4) SF can be used to help participants recognize and bridge the connection between science, technology, art, and literature.

5) Science fiction is absolutely loaded with imaginative aspects created by the writer and re-created in the minds of the reader.

6) It can build the long sought for academic links between science and the arts.

7) SF stories and such can warn us of the extremes of using technologies without fully understanding their ramifications.

8) The SF theme in movies and novels is ever-present, not just a flash in the pan. Many SF shows of the past are in continuous re-runs so the library of SF is large and growing. There seems to be no end for SF movies or novels.

Change is the principal feature of our age and literature should explore how people deal with it. The best science fiction does that, head-on.

--David Brin

One only has to look at the incredible special effects incorporated into modern movies to realize how powerfully imaginative this genre has become. Think of the social impact that popular TV and motion picture science fiction classics like Star Trek have had on all of us. Think of their mission: "To boldly go where no one has gone before." Think of the images created in your mind when you hear the terms

“Warp Speed,” “Klingons,” “Phasers,” “Tricorders,” “Photon Torpedoes,” “Shuttle Crafts.” These terms have become indelible parts of our colloquial lexicon. “Beam me up Scotty!”

Science fictional creativity and imagination have impacted our language, stimulated our art and movies, generated many new science fiction writers, and given raw meat to another generation of inventors and futurists. That old TV show handled some very serious social issues as well; and all this combines with futuristic science and technology in a wonderful stew we call progress where everything is connected to something else. The concept of android robots like Commander Data of Star Trek portrayed the powerful merging of robotics and artificial intelligence [AI]. Now we are getting pretty interested in this technological pairing today. AI certainly can be a harbinger of what is to come.

Joseph Engelberger, the father of modern robotics, and an icon I was privileged to work with, once told me his reading of Isaac Asimov’s early novels was the motivating force for his interest in pioneering robotics technology. Science fiction has the power to influence hearts, minds, careers, and imagination.

Consider these technologies and how SF promoted earlier versions of them:

- Those popular 3D printers we see appearing in school maker labs—aren’t they the “replicators” on board the Enterprise in Star Trek?
- Our modern submarine traces its roots to Jules Verne’s classic *20,000 Leagues Under the Sea* (1870).
- Laser cutting tools derive from futuristic space soap opera adventures dealing with ray guns.
- Even the idea of space travel comes from futuristic flights of fancy in early SF novels.
- Modern rocketry was inspired from H.G. Wells’s *War of the Worlds*.
- In 1914, H.G. Wells published *The World Set Free*, imagining the emergence of “artificial” atomic energy. The arrival of atomic energy in the novel was set as 1933. About ten+ years later, the A-bomb was fabricated and tested.
- The modern cell phone was inspired by portable communications like that used in Star Trek and other movies.
- Human organ transplants come to us from Mary Shelley’s 1818 iconic book, *Frankenstein*, where organs are put together to create a new human life form.

These are just a sampling of some of the technologies that began as SF. Consider this last example. A famous literary character of the early 20th century was Tom Swift, a genius inventor who was the protagonist in a series of juvenile science fiction books. I confess to reading these still! NASA physicist Jack Cover who invented the Taser was a fan. “Taser” is an acronym for one of Swift’s fictional inventions, the “Thomas A. Swift Electric Rifle.”

I also would like to add the movie *Aliens*, which, besides being scary, has a scene where the heroine fights an alien with a powered suit used for moving heavy objects and garbage bins around. That suit is a forerunner of the exoskeletons we see being developed today for helping handicapped humans, and for soldiers as well.

Twister, the movie about storm chasers, is a low impact SF movie with a very practical aspect—to be able to disperse small sensors into the storm to model its behavior. Such sensors have become practical already and generally fall under the category of smart sensors. These can be distributed in rivers to model pollutant dispersal and with the advent of nano-sensors, such devices may one day be injected in a bloodstream to monitor for disease and perhaps even dispense life-saving medications [sounds like 1960s movie *Fantastic Voyage!*]. It is amazing how these technologies and themes interrelate.

Are you convinced of the power of this genre of literature? How can you focus this power to spur creativity and imagination in your gifted and talented (GT) classroom?

Individual science fiction stories may seem as trivial as ever to the blinder critics and philosophers of today, but the core of science fiction -- its essence -- has become crucial to our salvation, if we are to be saved at all.
--Isaac Asimov

Science Fiction in the Classroom

Have gifted and talented (GT) student teams examine the literature to identify SF works that influenced the world. Do it in three parts:

- Stories before 1930
- Stories in the Golden Age of SF: 1930-1960
- Stories from 1960 to the present.

What major themes, if any, are evident in these time frames? What are authors trying to tell us or warn us about?

One of the great SF movies of the 1950s was *Forbidden Planet*, an unusual story about a long past civilization, rediscovered, that wiped itself out

because technology got out of hand. The inhabitants of this advanced civilization developed unlimited power to create things in real form from their imaginations—until their sub-conscious minds began creating “monsters from the id.” This is one of my all-time favorite SF movies. Dig deep into this one, and maybe watch it in class. An early movie robot is also featured here, *Robby the Robot*.

Have GT students examine how war has produced huge advances in technology that ultimately resulted in wartime technologies used for peaceful purposes. WWII is a great example of this. Students should identify what became of the atomic bomb and how we used its terrible power for more peaceful purposes. Study this in detail and enumerate all the beneficial spin-offs from this. How did the use of rockets during WWII morph into the 1960s space race to the Moon? By the way, what were some of the spin-offs of our race to the moon?

Have a class visit the Library to read old newspapers and magazines, uncovering the excitement of those time periods—the pseudo-science fiction speculations of then popular writers and reporters—and compare what effects the technology actually turned out to have on our society 50-75 years later? This is a fine lesson on how change rumbles through our culture, getting filtered and modified along the way.

Have students speculate on what the multi-dimensional impacts of some of today’s technology might bring 50 years from now. Examples:

- Genetic engineering
- Nano technology
- Artificial intelligence
- Artificial organs
- Solar energy
- Energy from plant life (biofuels).

An especially interesting subject is the portrayal of technology in past

world fairs. Here the theme of science fiction is center stage as companies and organizations try to envision what the world will look like 50-100 years from now. Artists, scientists, and engineers combine their ideas and imaginations to create a possible future scenario for humanity. The World’s Fair of 1939 is a classic example of this legitimized dreaming. Why not study past world fairs and the visions and imagination they offered?

The Connection to Art

Chesley Bonestell, America’s premier space artist and illustrator influenced many of today’s rocket engineers and scientists to pursue their dreams. His bold and visionary graphic portrayals of planetary worlds fired the imaginations of a whole generation of science fiction writers, further fanning the flames. He took them to the solar system’s most exotic places, long before Von Braun made it possible to dare to dream of space-flight.

Take a look at past magazine advertisements and artwork that illustrated new technologies and how they might be used in the future. Everything from home appliances to cars to buildings is impacted by how and where we believe technology is going to take us. Consider how rapid advances in jet aviation in the 1950s and 60s inspired the sleek, fin-shaped refinements of automobiles of that period.

Architects design buildings that have as much theme as they have functionality. Their structures make social and cultural statements. Technology and their speculations about how it might affect us, influence how they design and build structures.

Thomas Edison invented the very utilitarian concrete house. Examine what that technology produced in terms of “art” and compare it to classical home building designs of the 1920s and 30s; and against some of the more modern designs. What do these designs say about how technology “feels” to your

students? Which type of home best fits their preferences? How might they feel in a world where the buildings do not fit their preferences?

Discuss with your students how technological advances in paints, materials, and tools have allowed artists, painters, sculptors, and designers to boldly try new art forms. Look at how computer art and animation have completely changed our visual forms of entertainment. Compare this to the then revolutionary work of Walt Disney in the 1930s and 40s.

The Hollywood movie technique of “morphing” has allowed studio artists to create whole new families of imaginary characters and alien beings for movies. The eerie shape changing transformations produced by this cinematic technology has completely changed our ability to create almost unbelievable movie scenes at reasonable costs.

Science fiction is the most important literature in the history of the world, because it's the history of ideas, the history of our civilization birthing itself. ...Science fiction is central to everything we've ever done, and people who make fun of science fiction writers don't know what they're talking about.

--Ray Bradbury

Epilogue

I believe it was Albert Einstein who once commented, “imagination is more important than knowledge”—a most perceptive and unexpected quote from one of planet Earth’s most towering intellects.

Science fiction is constructive imagination, focused on how technology and science affect the future. Its premise is the impact that both have on society. What better way to explore what we envision technology education to be—the study of the human designed world. Integrate science fiction into your gifted classroom. Supercharge your

student creativity and imagination!

Alvin Toffler, author of the incredible books *Future Shock* and *The Third Wave* once opined about science fiction:

Science fiction is held in low regard as a branch of literature, and perhaps it deserves this critical contempt. But if we view it as a kind of sociology of the future, rather than as literature, science fiction has immense value as a mind-stretching force for the creation of the habit of anticipation. Our children should be studying Arthur C. Clarke, William Tenn, Robert Heinlein, Ray Bradbury and Robert Sheckley, not because these writers can tell them about rocket ships and time machines but, more important, because they can lead young minds through an imaginative exploration of the jungle of political, social, psychological, and ethical issues that will confront these children as adults.

Classroom Challenges

Here are some classroom projects you can try with your GT students.

- If friendly aliens landed in your backyard, what would you tell them and show them that you think would make a favorable impression about our planet and the capabilities of its inhabitants?
- Your name has been selected as a member of a special national team to send a message into space that may someday be intercepted by an alien culture. In the hopes of telling them about your world, what media would you use to transfer information about it?
- The field of special effects is a combination of imaginative technology, science, and art. How did this field develop? What was the lineage of the special effects from early science fiction films of the 1950s to today’s mega-hits with their sophisticated techniques?

- Survey your class to determine which science fiction movies are the favorites of students. What appealed most to them in those movies and why? If the movie had a musical sound track, how did they feel the music matched the movie’s “feel” and why?

- Read some of the old science fiction and compare it to modern literature. How are they similar or different? Look at classic literature and see how many exciting books were actually science fiction based.

- Challenge students to write a short science fiction story—for example, 250 words. Allow them to make it funny, serious or ironic, whatever they choose.

- Introduce students to the incredible stories of Rod Serling and his landmark *Twilight Zone* TV show of the 1950s/60s.

- How are science fiction and fantasy both similar and different? Get this discussion going in your classroom

Harry T. Roman is a retired engineer, teacher, inventor, and author. He has published over 600 articles, papers and scientific treatises, along with 75 teacher resource products including books, math card games, and science kits. A recipient of multiple awards for his outstanding service as an educator, as well as his pioneering technological achievements and inventions, Roman is currently an educational advisor for the Edison Innovation Foundation, and often visits local schools to work with teachers and students.



These are the Ones Who Will Save Us: How to Identify Deep Souls in Your Classroom Before It's Too Late

by Kathryn P. Haydon

Early in his career, E. Paul Torrance worked at a boarding school for boys who had misbehaved. Torrance noticed that many of these boys had a special spark. He read the book *Square Pegs in Square Holes* by Margaret Broadley. In it, “she described creative individuals as those possessing an ability which, ‘unless it is used and directed into the right channels . . . is like a wild colt roaming the prairies’” (Cramond, 2013, p. 27).

After this, Torrance began to see wild colts everywhere. He knew these kids were special, but most people didn't. Torrance was determined to help understand and support them.

Many years of teaching also led me to notice this special “wild colt” quality in many students and adults. For years, I tried to describe them as members of the categories we know, like gifted and highly creative. I could understand them with my broad conceptions of those terms, but usually society's definitions were and are too narrow to include these kids. They confound most people because, like Torrance's students, they share a key commonality: traditional school does not fit them.

Since school does not fit, they can often become branded as behavior problems, misidentified as learning disabled, or written off as lazy. These negative mis-labels come with a lot of emotional baggage that is hard to shake off even as an adult. The “wild colts” who do survive school without major emotional trauma often do so when two conditions are met:

1. They have a high degree of creative self-efficacy (Tierny & Farmer, 2002; Beghetto, 2006), knowledge that they have creative strengths and can use them to produce novel and useful outcomes.
2. They had one or more mentors who reinforced their creative self-efficacy, often by giving them the opportunity to productively employ their creative strengths. Often this is a teacher or a mother.

They Need a New Name or They'll Be Called the Wrong Names

After years of researching, working with thousands of students and adults, and applying the science of creativity to my work, I have identified seven characteristics that these “wild colt” individuals tend to share. To build this designation, I've conducted in-depth research on eminent creators,

rebels, daydreamers, class clowns, highly and profoundly gifted people, outlier learners, people with diagnoses like dyslexia and ADHD, and creative strengths.

The words gifted, highly creative, highly divergent, and innovative only capture a sliver of their essence. So, I've also given these individuals a name: deep souls.

Life does not fit deep souls, but they are so important to life. I believe they are the ones who will save us. They are the ones who have the ability and tenacity to think differently enough to get us out of the problems that we face. We must understand deep soul kids before it's too late—and it's almost too late.

In order to understand themselves, deep soul kids need adults, especially teachers, who understand them. Because many of their traits relate to creativity, creative self-efficacy is essential. The following seven characteristics are common among deep souls, and relate to their creativity. I detail each with how it might look in a classroom or at home.

But first I'd like to share a story. Last year, I wrote an initial article describing the seven characteristics of deep souls. The response was incredible, and I received many emails and calls telling me just how helpful this article was to them. It was reprinted in several publications.

Adrienne's Story

Adrienne Roberts' response was particularly impactful. Adrienne is an original, expressive thinker. She is a high-quality educator and has incredible dedication to her students. She survived school because she didn't go to traditional school. Her mother supported her individual strengths and growth through homeschooling, and to this day Adrienne is a voracious learner. Yet even so, she didn't always understand herself.

Kindly, Adrienne has given me permission to share her words with you, hoping that it might help more deep souls and deep soul kids be understood:

After your first email that was so helpful to me, you directed me to read your article on deep souls (Haydon, 2018). I realized that never had I felt so understood before. It turned my life upside down (in a good way!) and gave me the courage to begin to change my life journey and start to write a new chapter that was free of past expectations that others had placed on me.

I had always tried to fit in and be normal as far back as I can remember. Once I headed back into the workplace full time two-and-a-half years ago, I started to realize again just how different I am. At first, I was an asset. An invaluable employee. Irreplaceable. Once I was overloaded with deadlines and new corporate mindset employees were brought on board, I then was shot down constantly for my out-of-the-box thinking. I was exhausted trying to suppress the unique essence of who I am so that I could keep everyone else happy. Everyone was mad at me for something it seemed all of the time!

Then your email came and once I discovered that there were others that were in the same odd pod as me, it was freeing. Like me, they couldn't find a label for themselves but unlike me, they embraced it and ran with this realization. And that was when I realized that being free to approach life the way that I saw it was not only okay but beautiful, spectacular even. It isn't the same as the

majority of humans and that's okay too. I slowly allowed myself to accept that I am different (I use the word "quirky") and that I literally see the world around me differently than most people.

I started to feel creative again and left the people that held me back. I stopped comparing myself to others. I realized that I have a lot to offer people and I need to stop apologizing (to both myself and others!) and feel proud of my work, not ashamed that it doesn't look or feel like everything else everyone does. Sometimes the road is lonely (this summer was one of the most difficult times in my life) and I wish that I could fit in with the cool girls but then realize, I am really the cool girl! I am the one that gets to be, do, and create cool things. My brain is always active with new ideas that have the potential to change our world, to help others, to bring happiness, and beauty and that is amazing!

Deep souls deserve a name because if they don't have one, they get called many other names—and too often, they are weakness-based or suggest incompetence or poor behavior. It is my hope that sharing these seven characteristics of deep souls will help teachers and parents identify deep souls early in childhood. Adrienne is the mother of a college student. I'm so grateful that she has now gained more self-understanding, but it would have saved much angst to identify as a deep soul earlier in life.

Not all deep souls have all seven characteristics fully developed, especially as kids. You may have to look hard to see them differently than other people do—in a new and different light. But if you can see them and connect these strengths with them, you have the chance to change a life, by helping them gain creative self-efficacy and, perhaps, a mentor.

Most human beings have deep soul characteristics to some degree. But deep souls have them intensely. If you feel a student is a deep soul, he or she probably is. Here are seven commonalities that deep souls tend to express when they are being purely themselves.



Minji Kim

Seven Strengths of Deep Soul Kids (besides a past or present disconnect with school)

1. Bravely Independent

Deep souls are independent all the way around. They don't just take your word for it—they've got to figure it out themselves. They don't like to be told what to do. They won't mechanically follow rules to play the game; they need to know the reasons behind the rules and for playing in the first place. If it makes sense or seems purposeful, they might play. They cringe at the idea of blindly following the crowd. They might do what others are doing, but only if they've come to the conclusion that it's worthy.

Their independence might seem like stubbornness. The pressure to conform is so intense that it can take stubbornness to protect one's unique identity from being absorbed. The flip side of stubbornness is courage. It takes courage to think independently. There is constant pressure to toe the line, follow the norms. Independent thinking offends the crowd; it causes those who are content to follow to feel threatened. Deep souls tend to hold freedom as a top value. They need opportunities to exercise their independent thinking. Risk-taking is essential for true innovation and deep souls take the greatest risk in being themselves.

Deep soul students may seem like troublemakers—rebels, perhaps. But they are crying out for opportunities to exercise their independence, a valuable strength, within the classroom. They benefit from choice, including the classes they take, and from assignments that allow them to exercise their original thinking.

2. Meaning Seekers

Meaning is at the heart of everything deep souls do. In fact, without meaning, they probably won't do it. Deep souls think in 4D and the ever-present fourth dimension is meaning. Meaning usually connects

back to deeply-held values, interests, or strengths. If they can tie into one of those, then motivation runs high.

Deep souls aren't divas. They aren't trying to be smug when they require meaning in their lives. This need is baked into their being. Meaning is fuel—high octane. When a deep soul finds her spark, it's like turning on the ignition and the fuel burns red-hot. Meaning goes along with independence. Deep souls are unlikely to feel satisfied following the crowd or implementing without purpose. But once motivation is kindled from within, there is no stopping them.

At school, deep souls may simply refuse to do rote work. Tasks like memorizing math facts lack meaning. To learn these facts, they need to connect up with something they love. At a young age, it might be skip-counting to music or creating a number story. At an older age, they may need to know why what they are learning matters, in a more authentic way than is described by the problems in many math books.

3. Deep Divers

Speaking of meaning, when ideas or projects have captured deep souls' interests, they will likely become engrossed. You might not see them again until they've explored all aspects of the topic. But if you tell them something they must do and they can't connect it with meaning, they might stall, forget, or do "just enough." If their lives are filled with meaningles (to them) tasks, they may disengage or rebel. The key is to find meaning in daily tasks or at least pursue interests on the side. Otherwise they will become disconnected from their sparks.



Deep souls may appear to be slow workers. They are not dumb or learning disabled, but are mining for depth. Think about the updated Bloom's Taxonomy (Krathwohl, 2002). It is typically depicted as a pyramid, with creative thinking at the top as the most complex cognitive function. Memorization is the base of the pyramid, the lowest level of thinking.

I believe Bloom's is more accurately expressed as a circle. This visual shows that when you are doing real creative thinking, you are using the other thinking skills as well. But when you are doing tasks like memorization, you are skipping out on higher levels of thinking. This is the disconnect for many deep souls. When work focuses on lower-level functions, they become disengaged because they are not using enough of their minds. It is essential to use creative learning principles to structure learning opportunities that engage all levels of thinking in order to engage deep soul students.

4. Knowledge Questers

At the core, deep souls are curious. They want to know and learn, and they seek truth. Usually they are self-directed; they get intrigued about something and pursue it with intensity. They might ask a million questions or dive into books and articles or make quiet, astute observations. They probably learn by experimenting, exploring, and doing. Their thoughts don't go efficiently from A to B because on the way they are connecting A to everything else they know. Connections fuse and pop in their minds, creating new insights. They probably don't have a linear learning process and most likely don't love sitting through a lecture without the opportunity to take the information and run with it. They tend to learn most when given independence and autonomy, collaborating with other deep souls, or consulting with experts who ignite their imaginations. They tend to inhale knowledge or absorb it in non-traditional ways.

Again, deep souls may seem slow. It is hard for them to simply go from A to B. They need to make broader connections. Connection-making is essential to problem solving and one of the most valuable skills a person can have! It is tempting to train deep souls to fall into line so that they just "do the work," but it is much better for all to design work that leverages their thirst for knowledge and connecting across disciplines.

5. Learn By Making

Deep souls like to keep it real. They learn actively, applying new ideas to what they already know. They learn by making—connections, ideas, scenarios, things, systems . . . They think in spirals, connecting new information with old to find patterns, themes, solutions. This might take longer. It might look messy. New input is like flint to the stone of their minds, constantly making sparks. This active, original thinking is meaningful. Deep souls want to solve problems and they do it through writing, experimenting, building, sharing, testing, tweaking, tasting, or imagining. Thinking is constant and original. They resist unthinking implementation. "Just memorize it" or "just get it done" are commands that won't get very far with deep souls. Again, making leads to meaning.

If deep souls attend rote-learning schools, where content is generally prescriptive with little choice, they may not perform nor pay attention. Making can include writing a creative story or poem or answering a question that requires original thinking; the key is tangible application of original thought.

6. Intuitively Sensitive

Though some may hide it on the outside, deep souls are universally sensitive. Their sensitivities manifest in many forms. They may be deeply empathic or sensitive to their environments. They often "know" what others are thinking. They can sense

discomfort or criticism even when it's not voiced. They highly value respect and can quickly sense when someone is pandering to them. They are sensitive to criticism, especially from those who don't understand them. They have an acute sense of fairness and feel deeply. Their intuition is strong. They sense gaps between what someone says and what they actually do. This sensitivity ties into their pursuit of authentic understanding.

If you have a deep soul in your classroom whom you don't like that much, the deep soul knows it. They can feel your disdain or irritation. Even if you can find one thing that you genuinely like about that student, communicate it to him, and give him an opportunity to express the strength you identified. In this way, you will do wonders for his self-efficacy and, likely, engagement in your classroom.

7. Crave Authentic Understanding

Above all, deep souls want to be understood for who they are authentically. They want to understand themselves, too. Since they are outliers, they experience this less often than most. They are fortunate if they have someone in their lives who truly gets them, or at least who lets them be themselves. All of their characteristics together make for powerful fresh thinking, but others might view deep souls as complicated and thus they are less likely to be understood by the world. This can lead to self-doubt or a feeling that something is wrong with them. In fact, deep souls' abilities to be individuals and think as individuals are vital. Though they are often criticized for their unique approach to life, their ability to think differently helps devise new solutions, inventions, and ideas for the benefit of all of us.

Even nonconformists want more than almost anything else to be genuinely understood by another human being. An adult who understands a deep soul kid is invaluable, because the adult has clout. If you can take this list, identify the deep souls in your midst, you have understood. Communicate

that understanding, apologize for the past if you need to wipe the slate clean. Show them this article. You will help with creative self-efficacy and probably become a mentor.

Is Everyone a Deep Soul?

The underlying traits that fuel deep soul strengths are universal characteristics of creative thinking. Research shows that nearly all of us have an intense combination of these strengths in early childhood, but they lose their luster over time—especially during our school years. Deep souls, however, have resisted this dulling. They can't help it. The intensity of their ability to think differently cannot and will not be stopped.

Because of this, they are at risk of being misunderstood. They need people around them who, from an early age, recognize their differences as strengths and help them channel these productively so they can grow and blossom. I've created the free Sparkitvity Strengths Spotter tool to help us identify and cultivate deep soul strengths. (You can find it here: www.sparkitvity.com/strengthspotter) When we recognize these as ours too, we are more open to seeing them in others.

So, yes, we can all cultivate our own underlying deep soul strengths. But I have coined this term to help us find those who by nature seem to defy labels of any kind and thereby become susceptible to incorrect ones. We now have an accurate lens through which deep souls can be understood and grow, for the benefit of us all.

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- Kathryn P. Haydon**, founder of Sparkitvity (<https://sparkitvity.com/>), writes, speaks, and consults to support an educational paradigm based on student strengths and creative thinking. She is a keynote speaker and consultant for schools and families nationwide. Kathryn co-authored *Discovering and Developing Talents in Spanish Speaking Students* (Corwin, 2012), as well as *Creativity for Everybody* (Sparkitvity, LLC, 2015).

Stop Blaming “The Student from Hell”: Dispelling the Myth Through Creative Teaching and Enhanced Student Engagement

by Iman Rasti

Introduction

Describing what some teachers name the biggest obstacle to good teaching, Parker Palmer, in his 1998 seminal book, *The Courage to Teach: Exploring the Inner Landscape of a Teacher's Life*, speaks of “The Student from Hell”—a universal archetype that can take male or female form. This student may be silent, sullen, withdrawn, and indifferent; the one with little capacity for conversation and no desire to engage well with ideas; the one with a short attention span.

As educators, we all have encountered the so-called Student from Hell. Last year, for the first time in my long teaching career, I was handed over a seventh-grade American history class where at least two out of three students easily met the criteria for Students from Hell: impulsive, disorganized, disengaged, even diabolical at times. As a banner announcing a national conference on teaching and learning (cited in Palmer 1998, p. 41) once put it, they were students “with no direction or motivation; with little knowledge of the social skills necessary for teamwork and negotiation; bored and passive in situations calling for action, and belligerent and destructive in contexts requiring reflection.”

I must admit, the first couple of weeks challenged me in a way I had never been before in my career. Day in, day out, my only goal was to simply maintain my sanity and that of a handful of “normal” students by trying

desperately and obsessively to either waken the silent ones or silence the loud ones. However, I knew that I would be doomed to self-defeat in my attempt to tame the Students from Hell the moment I let myself fall into the trap of labeling and blaming. Instead, I had to clearly see their needs and become more aware of my own role in the generation of their questionable behavior. Put simply, I knew I had to fight the stereotype. I refused to call them the Students from Hell.

What encouraged me to keep moving forward optimistically was the echo of Palmer's observation (p. 45) that “The Student from Hell is not born that way but is created by conditions beyond his or her control.” As a classroom teacher, there are certain things that are beyond my control, too. For example, I have no direct control over my students' nutrition, sleeping habits, or how much they exercise, watch TV, or play video games. Nor do I have direct control over their family dynamics, potential substance abuse, or absentee parents. But there is one thing that I can almost always be in full control of, and that is *how* I teach.

One thing the so-called Students from Hell desperately need is good teaching—the kind of teaching that creatively engages them with the lessons, provides them with the right level of challenge, and helps them become active participants in the learning process. *Creative* teaching facilitates good teaching. Teaching creatively, no matter the age group, grade level, or

subject matter, improves student engagement. When students engage, teachers can better address their needs. Acknowledging the many variables at work in a lack of student engagement and the limited capacity of schools and classroom teachers to address all of them, this article proposes the use of *creativity* in introducing new lessons, tasks, activities, or projects as one way to motivate and inspire unresponsive or reluctant learners.

Engagement is Key

It goes without saying that for optimal learning to take place, we need to ensure our students are deeply involved in the learning process. Engagement with the topic can alleviate most of the “behavioral” problems that often identify the so-called Student from Hell. In addition, continual engagement helps students thrive academically. If academic lessons align with personal interests, students are more likely to remain deeply immersed with the topics. Kaufman (2013), for example, points out that continual engagement correlates with increased ability in the domain of personal interest:

Engagement and ability are inseparable throughout human development, dynamically feeding off each other as we engage in the world. Our interests and passions direct our attention to key aspects of a stimulus, and cause us to ignore other aspects. Importantly, our continual engagement builds up the expertise base that allows us to reach higher and higher heights of performance (p. 303).

There are different types of classroom engagement. Exploring the correlation between openness to experience and creative achievements, Kaufman (2013, p. 276) introduces three types: intellectual (desire to engage in complex problem solving and abstract reasoning); affective (desire to engage in the full range of emotions, including a preference for making decisions based on affect-laden intuitions); and aesthetic (desire to engage in holistic patterns, perceptual experience, and fantasy). The common thread in Kaufman's definition of these different types is "desire" to engage in an activity, whether that activity is intellectual, artistic, or aesthetic.

Fostering the desire to engage in any classroom activity is therefore paramount. However, creating a classroom atmosphere where disengaged students remain internally driven and find it *desirable* to be active agents in the learning process can be a daunting task requiring patience, persistence, and of course, expertise. And certainly, it involves so many other variables (e.g. building relationships, developing empathy, presenting the right level of challenge, and offering personally relevant topics, among others) to work in harmony for any long-term change to happen. The disengaged students often walk into the classroom with a preconceived notion that they are not smart enough, that their voices do not matter, or that they would be safer to remain silent (or extremely loud to mask their fears). The more the so-called Students from Hell remain disengaged, the more difficult it is for them to make connections between old and new information, to activate memory, to make sense of and conceptualize learning, or to improve soft skills (e.g. teamwork, problem solving, or communication).

We who teach, therefore, have an obligation to mitigate the degree of disengagement as much as we can to help facilitate the process of deep and joyful learning. But as Homes (2017)

points out, "Sometimes even the superstar teachers—the inspirational, motivational 'life-changers'—are limited in their abilities to create self-determination." Instilling self-determination in disengaged students is by no means an easy task; however, we can plant the seeds by sparking engagement before the actual content lesson starts.

It can be argued that creatively hooking the disengaged students with a lesson *before* it starts is the first step toward transforming seemingly unmotivated learners. Doing so barely gives them a chance to enter an emotionally negative state where they would be completely reluctant to participate in the process. How many times have we heard colleagues lament about disengaged students, hopelessly wishing, "If they would only give me five minutes of their attention so I could introduce my lesson!"

It all starts by capturing and controlling the students' attention in the first few seconds they step foot into the classroom. E. Paul Torrance, a pioneer figure in creativity research and education, reminds us that before the actual lesson starts "something has to be done to heighten anticipation" (Torrance and Sisk, 1997, p. 91). But why is that so important to capture the students' attention the moment they enter the classroom? And equally important, how can we do that?

Controlling Attention through Novelty

We are surrounded by thousands of bits of stimuli at any given second, but our brains cannot process all of them at the same time. The Reticular Activating System (RAS), a filter residing in the lower part of the posterior brain, filters almost all the incoming stimuli and selects only the necessary information to which we consciously attend (Willis, 2017). RAS responds to and gives priority to novelty, which means new stimuli have a higher chance of entering the brain.

Here is how this simple, yet extremely important neuroscience concept applies to teaching. To immediately engage students in the lesson you are about to teach, you have to introduce it to them in a *novel* way. The novelty of the lesson's presentation unleashes this filter and allows incoming stimuli to get into the brain (Rasti, 2018). In other words, because of this novel exposure to the lesson, students' RAS filters select the new information and let it, and not any other external stimuli surrounding the students, enter their brains.

The entry of novel stimuli into the brain has another important advantage. Novel stimuli will release dopamine, an important neurotransmitter in the brain. The release of dopamine not only increases the students' sense



Dariana Yu

of pleasure, but also enhances alertness, memory, and motivation (Willis, 2009). This surge of focus and motivation, in turn, facilitates optimal arousal, enabling brains “to be alert, receptive, and ready to attend and learn” (Littman, 2017). Therefore, heightening students’ anticipation through creative and novel activities prior to the lesson may lead to higher student engagement.

Heightening Anticipation

Heightening anticipation before introducing a new lesson is a principle that can be employed when teaching any subject matter to any age group. The key is finding the courage to break from our regular teaching routines so that we can creatively engage our students at the very beginning of class. To better understand the importance of disrupting routines to increase student anticipation, we can use a physical fitness analogy. When building muscles, athletes learn to confuse their muscles. Changing their exercise routine regularly is considered a good way to increase strength and muscle definition. Similarly, as classroom teachers, we also need to vary our routines to momentarily *confuse* the students’ brains before we start teaching. This *brain confusion* can help increase focus, attention, and ultimately, engagement.

Informed and inspired by the educational neuroscience principle related to the RAS filter and by creative teaching tools and frameworks (see, for example, Torrance & Safter’s Creativity Skill Sets, 1999), I tried to be more deliberate in how I introduced my American history lessons, activities, and projects last year. When teaching the trial of John Brown in our Civil War Unit, for example, I decided to set up my classroom differently by rearranging the furniture, transforming it into a typical 19th-century American courthouse with designated seats for the judge, victim and his lawyer, defendants and prosecutor, witnesses, and jury. I did all of this *before* the students came to the class. Once they walked into the class-

room, I did not need to say anything, but let them observe and then follow their curiosity by asking me questions about the new arrangement or making predictions, both of which were great ways to capture their attention. The different classroom setting also sparked the students’ engagement by allowing them to *visualize* a historical event, making it desirable for them to be active participants in the lesson that was about to ensue.

When studying the American Revolution, I designed a project where my students had to reconstruct a typical non-combat, camp day of a Continental Army soldier during the American Revolutionary War, with emphasis placed on setting up a tent, making a fire, and cooking colonial cuisine. Although the project in and of itself offered a lot of engaging activities, I still needed to further arouse my students’ curiosity, get their attention, and ignite in them the desire to continuously immerse themselves in the lesson throughout. So, when the time came to announce the project, I decided instead to reveal it differently—in a piecemeal fashion, instead of simply saying, “This week, we are going to ...”

When I received the package I had ordered with the tripod campfire stand as well as iron-cast crock pots and other cooking utensils, I simply unpacked the box and laid everything on my desk for a few days without telling anyone what they were going to be used for. I did the same when the canvas tarp, cords, and poles for pitching the tents arrived. Putting all these items on display without offering any explanations about their use inspired intellectual curiosity, enabling them to explore their imaginations and make predictions, all of which resulted in the desire to engage in the subsequent activity.

I have placed colorful print-outs of Colonial stamps on students’ desks before teaching the 1765 Stamp Act Riots, put up a giant image of the 1770 Boston Massacre engraving on

the Smartboard before teaching a lesson on it, placed bowls of popcorn on each desk before watching an episode of an HBO documentary when learning about the Declaration of Independence, and hung the flags of the United States and Japan on opposite sides of our classroom before teaching Island Hopping strategy employed by the United States in the Pacific War against Japan during World War II. These are only a few examples of how I succeeded in engaging the most disengaged students before even starting my lessons, activities, or projects.

Closing Remarks

A disengaged student often unfairly gets reduced to labels—spoiled, stubborn, disrupter, or simply, the Student from Hell. This is partly because, as Palmer (1998, p 41) points out, “criticizing the client is the conventional defense in any embattled profession.” Shifting the lens through which we see these students, however, can offer promising changes to the landscape of teaching and learning. We can start, in a nonjudgmental way, by seeing these students as ones who are just wired differently. This will allow us to explore more productive ways to address their unique needs and thus get one step closer to creating a pathway toward deeper and more joyful learning for them and a more satisfying teaching experience for us.

Last year, I continued to remind myself of the overwhelmingly positive impact I had on my students’ lives and future, a reminder that further encouraged me to look for creative ways to transform the seemingly disengaged students into more focused, engaged, motivated, and purposeful individuals. By the end of the year, these students exhibited progress both academically and socially. More importantly, by being continually and creatively engaged, we built meaningful relationships with each other and the subjects we studied. These profound relationships were the key in helping me dispel the myth of the

Student from Hell. Once again, I found peaceful refuge in *creativity* as the answer to some of my most painful and intense struggles as a classroom teacher.

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Noor Abd. Al Hussain

The Power of Visualization to Stimulate Creativity: Seeing with the Mind's Eye

by Dorothy Sisk

Visualization coupled with self-talk can get the creative juices of gifted students flowing as they learn to see with the mind's eye. Many gifted artists, scientists, and mathematicians use imagery to creatively produce ideas and products. Notably, Einstein's method of thinking was visual and kinesthetic, and he described himself as seeing in pictures (Ghiselin, 1952). Visualization was particularly evident in the work of Nikola Tesla who would carry out experiments in visual images, and then go to his lab and create the product (Torrance & Sisk, 2001). Another advocate of using visualization to stimulate creativity was Margaret Mead. She served as a keynote speaker at a Creativity conference at the University of South Florida in Tampa in 1979, and stressed that through thinking in images, ideas emerged that would not otherwise. She shared the use of daydreams and imagistic thinking to explore alternative scenarios to problems. Using a problem-solving statement such as "what would happen if" she was consciously able to manipulate variables, allowing images to flow and unfold in her head to stimulate creativity.

History of Visualization

Throughout the history of mankind, two thought processes have been used, verbal and visual. Primitive mankind's consciousness was visual with little distinction made between sleeping and waking, or visions and perceptions. Dreams and fantasies were valued as much as cognitive thought. Mankind lived in union with nature (Torrance & Sisk, 2001). The closest that we come to this relationship in

today's world is in the culture of Native Americans and in some Eastern cultures. With the development of language and written systems for capturing words, rational thought became more important. In many ways, the use and development of visualization occurred in inverse proportion to the development of language and ways of recording words.

The use of language establishes distance between ourselves and our experiences, and this externalization causes words to lose the immediacy of the happening. In today's busy world, externalization through labels and abstracts shelters us not only from the immediacy of daily life, but from our inner strengths, such as creativity. This realization has stimulated interest in education to help rediscover the importance of visualization, because by using it we can inspire creative thoughts and images.

Philosophers and priests in ancient cultures used visualization as a tool for growth and rebirth. Since the time of the caveman, their paintings expressed spiritual visualizations (Sisk, 2019). The Old Testament is a rich source of visions and dreams, and one can recall the stories or parables of seven fat cows eaten by seven lean and gaunt cows, or the multicolored coat of Joseph. Religious leaders used these visualizations to help people reach their spiritual goals (Torrance & Sisk, 2001).

Preparation for Visualization

Psychologist Bob Samples used a method to center himself and fully experience visualization that always

brought nervous chuckles and comments. He would ask participants to place their thumb in their navel and then extend their hand or fingers. The point directly below that point is your center. He said then you can focus on that area and clear your head of random thoughts. You can help students become centered with these directions:

Concentrate on locating your center. Place your thumb in your navel and extend your hand or fingers. This is your center. Now that you have contacted your center, you can use this center to relax, to focus and to become more together and more centered. (Pause: ten seconds) Concentrate on your breathing and begin sending your breath to your center. (Pause: ten seconds)

Once students are centered, they can then be introduced to visualization activities such as guided visualization.

Guided Visualization

My favorite type of visualization is guided visualization, and there is usually a classic entry point, such as an image of a balloon rising, or an elevator to engage the students in the guided visualization, but my favorite entry is asking the students to take a walk up a hill. An example is below:

- *Close your eyes and see yourself walking along a path,*
- *Feel the sun on your face, lift your face up and feel the warm sun,*
- *There is a slight breeze and you can feel it gently touch your face,*
- *Hear the sounds of birds calling to one another,*
- *Listen, there is a rustling sound of leaves as small animals scurry to get out of our way,*
- *Notice how relaxed you feel being outside and slowly walking up the path.*
- *See the path leading up to a hill, and on top of the hill, an old man is sitting cross legged in front of a small fire, and he beckons you to come and sit.*
- *See yourself smiling at him and asking a question. See him nodding and answering your question, and he reaches into a small pouch to give you an object.*
- *Hold the object tightly in your hand and thank him.*
- *See yourself beginning to walk down the path.*
- *Be aware of the sound of the birds,*
- *Hear the rustle of leaves as small animals note your passage,*
- *Feel the gentle breeze, and the warm sun.*
- *Then very slowly open your eyes, and look at your object,*
- *Reflect on it and on your question.*
- *Share your experience with one other student.*

Recently I demonstrated this guided visualization with a group of gifted high school juniors and seniors and several of their responses are included to demonstrate the power of visualization.

My question was, "What is my purpose?" and he said, "Be the best you can be" and he gave me a small plastic ruler." I see this as me being responsible for measuring my own growth and I am going to find my own plastic ruler. This was awesome.

Female, age 16

My question was, "How can I make a decision about what school to apply to for higher education?" and he said, "Make your decision with your heart and gave me a small glass heart." I have been trying to make a decision on facts about the colleges and universities, now I will concentrate on how I feel when I visit their campus, how my heart resonates to their community and atmosphere.

Male, age 17

My question was "How can I forgive my boyfriend for wanting his ring back?" He said to forgive and bloom like a flower. He gave me a daisy. The daisy is my favorite flower and I will think upon that and see myself as a flower blooming without him and letting my hurt go.

Female age 17

Imagery Poems

After the guided visualization, the students were given the following framework to use as guide or model to create an imagery poem.

See the -----
Hear the -----
Touch the -----
Smell the -----
See the -----
Hear the -----
Touch the -----
Smell the -----
I feel -----

This poem was written by a 16-year-old female student who said, "I can't write poetry, I never have written poetry." Then she ruefully smiled and said, "But I will try."

*See the path winding up the hill,
Hear the birds calling out to
one another,
Touch my face with the warmth
of the sun,
Smell the woody smell of the fire
on the hill,
See the old man bent over the fire
and sitting cross legged,
Hear him saying, "Sit down
and welcome."
Touch his hand as he hands me a rose,
Smell the lovely scent of the rose
he hands me,
I feel blessed that he answered
my question "How can I contribute?"
I must bloom like a flower!*

She was so proud of herself and especially pleased when her classmates asked her to read her poem. While she was reading, another student sketched her holding the rose. Not only were these students creative, but the atmosphere was genuinely positive and caring. The students became a community as they reflected on their experience with visualization. Cantu (2008) said

caring is one of the most important factors contributing to positive teacher-student relations, and I would add to creativity.

Most students love poetry and poems invoke mental pictures. Alisha was amazed at the beauty of her mental pictures and the affirmation she received from the other students. She said, "It was like a shot of B12." Another student responded as many typical gifted students would who want to do their "own thing," and resist using a model. She shared her poem—written after the visualization—using her own visions of what she called an "Autumn Experience."

*The crisp weather creeps into my bones,
Green leaves are beginning to turn,
Yellow, red, orange and brown,
Hear the crunch of the leaves as I walk.
Birds call out to one another,
Some fly in a V formation,
They fly high to where the sun
is the ruler,
I anticipate the visit with the elder,
He hands me a tattered book and
says, "Education" is your answer.
I want to be a teacher!*

Emily, age 17

The teachers of the gifted students were observing them during the visualization, and several asked, "When do we use visualization?" My response was in the beginning of a lesson, during a lesson, and after a lesson. I shared an experience I had teaching the gifted in Garden Grove, California. My sixth-grade students were studying the life of Picasso in one of our Creative Arts units, and I asked them to close their eyes and go with me to France. I described the garden of Picasso, an old creaking metal gate, a statue of a small goat standing on the walkway, and Picasso in spotted short trousers working on a painting. Then I introduced a book about Picasso with the very pictures I had asked them to visualize. They were amazed at how accurate their visualiza-

tions were, and then I asked them to imagine a painting that Picasso might create. The students were given time and materials to create their own paintings a la Picasso.

Our last visualization asked them to imagine white light around their entire body to help them be creative and to "see" what their next painting might be, to reflect on it, and then share with one other student. Years later, one of my gifted students told me she could still see Picasso's Garden in her mind's eye, and she visualizes that white light around herself when she wants/needs to be creative in her job at Disneyland.

Being creative is not always easy for all gifted students and they may resist trying something new that they feel is out of their comfort zone. Orloff (2014) suggested a mantra or request that students can use when they experience intellectual resistance to being creative.

Let me be willing to experiment.
Let me be willing to open my mind.
I want to release my closed-mindedness.
I want to release my rigidity,
I want to be receptive to what I haven't yet discovered (p. 97).

Visualization is like any skill: it gets better with practice. As gifted students practice it in the classroom and in their daily lives, they will receive new images and enter the constantly changing world of imagined subjects and objects. This inner imagery is truly like "movies of the mind," and gifted students respond positively to its spontaneity. They can use visualization when they face a problem they want to solve. The illumination of images is an "Aha" experience similar to what artists, authors, and scientists feel when they envision a work, imagine their characters, or visualize a solution to a problem (Sisk & Shallcross, 1986).

Kingsley Dennis (2017) talks about the realm of enchantment. As they experience the power of visual-

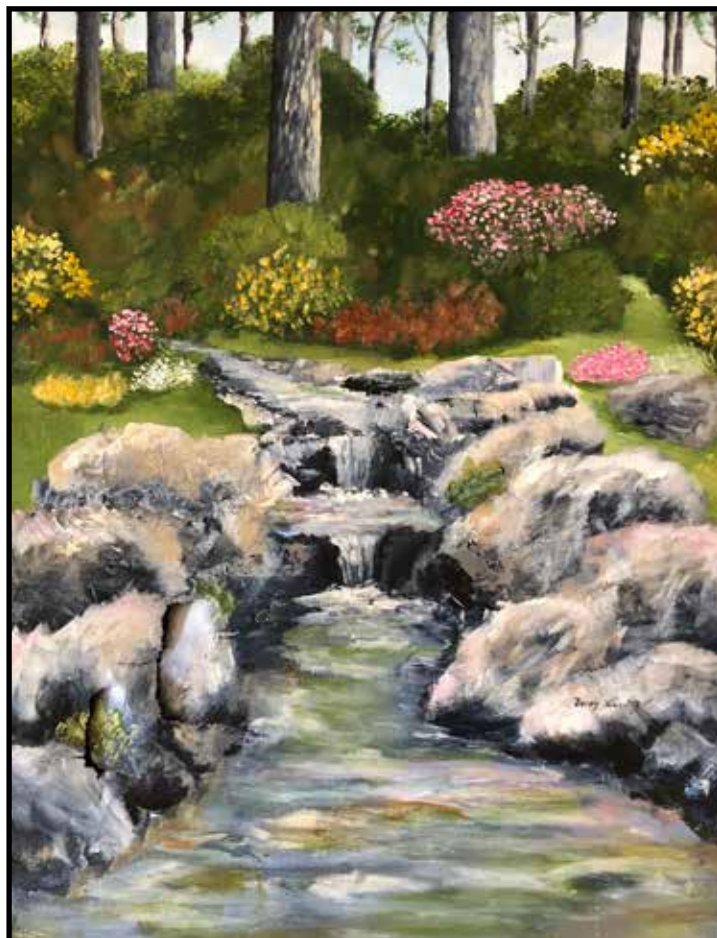
ization, gifted students can re-experience and re-enchant their desire to be creative, and find a deeper sense of purpose and meaning in their lives. One powerful visualization I developed from Dennis' chapter in Ervin Laszlo's *The Intelligence of the Cosmos* is to ask students to visualize in their mind's eye, to look up into the night sky and see the sparkle of stars. See yourself feeling awed and enchanted. Feel the grace, feel the wonder and the excitement of the unknown. With high school students you can then ask them to ask the question: Why are we here? Why do I belong?

High school students who have experienced this visualization are fascinated with the power of imagery, and they immediately asked for copies of Laszlo's book to ponder the questions "I have been asking for years." Visualization has the power to stimulate creative products and equally important, to stimulate creative thinking. Margaret Mead's famous quote about a small group of like-minded people being able to change the world comes to mind. This may well become the quest of our gifted and talented students as they stimulate their creative thinking through visualization.

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Recommendations for Improving the Education of Young Gifted Children

by Maurice D. Fisher and Michael E. Walters

During June-July 2018 something unusual occurred in the news cycle. This positive news event was the performance of human solidarity involving the plight of the Thai soccer team that was stranded in a cave. Besides, the Thai divers they were joined by volunteers from various countries including the United States, Great Britain, China, Australia, Belgium, and Israel. The entire event was inspired by the spiritual composure of the young teenagers trapped inside the cave. These youngsters were originally losers since all of them were rejected by their own school soccer teams. However, they became winners for a world audience.

The technology used by the rescuers was of the highest standards in areas of diving, sophisticated pumping operations, electronic communication, medical procedures, GPS location, and medical transportation. All of these procedures demonstrated what humanity can accomplish when they work together. Young gifted children need to be exposed to these technologies for them to understand how certain medical, communication and transportation developments can be used in positive ways. By stimulating their technology interests at a young age, they may become major contributors to the advancement of these and other fields.

The story of the Thai cave entrapment and the heroic rescue should be told in every gifted classroom to teach students about how technology can be used to achieve great humanitarian deeds.

Other object lessons that can be learned from this cave story are: caves have served as homes for early-mankind where they were used for protection from the elements, places to build fires for warmth, cooking food, providing protection for pets, making tools, and painting pictures on walls. Watch dogs were used extensively to guard groups and families who lived in caves. Young gifted children could use all of these factors to study how mankind developed from primitive groups to advanced societies.

Plato's Allegory of the Cave should be taught to all young gifted children. Here they would learn that caves conceal true knowledge, and that exposure to sunlight leads to understanding the real world.

This article demonstrates the importance of expanding young gifted students' awareness and understanding in all areas of human knowledge.

For Teachers to Increase their Knowledge of the Young Gifted Child

The following are practices that expose gifted children to broad areas of human knowledge, and lead them to an enriched understanding of their world.

1. Study the lives and works of the great masters of learning such as Leonardo da Vinci, Plato, John Dewey and Maria Montessori. Use information about their early years and later writings to determine important influences such as stimulating teachers and apprenticeships, parental encouragement, environmental opportunities, mentors in different fields of study, and educational and social opportunities.

2. Collect data on the early lives of individuals who represent the highest levels of thinking in literature, philosophy, politics, international affairs, science, mathematics, technology and commerce. Include the classics as well as sources from other cultures and ethnicities. Examples of areas to explore:

- Philosophy
- Literature
- Visual Arts
- Performing Arts
- Science
- Math
- Technology
- History

By studying individuals in these areas of learning and achievement, teachers need to answer the following questions:

What particular interests should a gifted child have in order to be identified with each one of these intellectual areas?

What types of skills should they have to show potentially high levels of achievement in each area?

How can teachers promote the development of particular interests and skills?

Examples in Teaching Science

As the result of observing a gifted child's interests in learning about the changes from daylight to nighttime related to heating and cooling in the atmosphere, teachers conclude that lessons in basic astronomy would be appropriate. After observing that the child develops a quick understanding of such concepts as the earth's rotation on its axis in 24 hours and movement over 365 days in a planetary ellipse, the child is presented with more advanced problems related to seasonal changes caused by the earth's angular relation to the sun.

The famous Greek, Archimedes, designed a practical method for measuring the area of a circle and explaining how levers work. Gifted children can learn from Archimedes about how to use empirical methods and mathematics to make scientific deductions.

Galileo showed that the velocity of different objects was the same regardless of their weight. He also proved that the Sun was at the center of the solar system by using telescopes to make systematic observations. Young gifted children can acquire ideas from his experiments to show the relationship between velocity and the weight of objects, and how planets move around space. These children can replicate studies in gravity by observing experiments in space stations and on the moon.

Ben Franklin observed how electricity traveled through the key on a kite. Young gifted children can use parts of this experiment to visualize the transmission of electricity.

Euclid, another Greek philosopher, designed the laws of plane geometry and scientific logic by using such figures as triangles and squares. Young gifted children can use geometric rules to study objects in space.

Include more contemporary scientists where applicable. Ellen Ochoa,

for example, joined NASA in 1988 and was the first Hispanic woman to go to space. A research engineer from Stanford University, she investigated optical systems for information processing, and has received NASA's highest award, the Distinguished Service Medal. Interested students can explore the STS-56 mission where she and the other astronauts performed experiments.

Examples in Teaching Music

The 1945 musical composition by Benjamin Britten, *The Young Person's Guide to the Orchestra* would be a good starting point for demonstrating the different instruments used in symphony orchestras. This musical and narrative performance shows young gifted children the musical characteristics (timbre, range, and role) of each instrument and how they can play together as a melodic force, reinforcing each theme through different rhythms, timbres and chord progressions. Another way to introduce them to classical music is by presenting music that has strong programmatic themes. Ralph Vaughan Williams' *The Lark Ascending*, composed on the eve of World War I, is a clear example of this type of music because it involves the use of instruments to imitate a bird's flight. Williams used violins and woodwinds to create the swirling flight of a skylark. This piece is indeed one of the most beautiful compositions in all of classical music.

Another fine programmatic composition is *Peter and the Wolf* by Sergei Prokofiev, a musical tour de force which also uses several orchestral instruments and narration to tell the story of how Peter captures a wolf. Different instruments provide thematic parts for each character, e.g., bird -- flute, duck -- oboe, cat -- clarinet, grandfather -- bassoon, wolf --- French horns, and Peter -- string instruments. The height of programmatic works for young gifted children is the ballet music from the *Nutcracker Suite* by Pyotr Ilyich Tchaikovsky. This music stirs the gifted child's imagination by using numerous

imaginary characters including -- Dance of the Sugar Plum Fairy, Russian, Arabian, and Chinese dancers, and Waltz of the Flowers.

The *Young People's Concerts* by Leonard Bernstein and the New York Philharmonic Orchestra were produced by CBS television during the late 1950s and throughout the 1960s. Bernstein and the orchestra covered a specific topic in each program such as instruments and tones, satirical and ironic music, comical music, modes based on modern and ancient scales, the music of Gustav Mahler, and three-quarter time as characteristic of Viennese composers. All of these and many other programs can be purchased through Amazon.com. Young gifted children will learn a considerable amount by viewing them.

Leonard Bernstein was one of the greatest geniuses in American classical music. As the host of the classical music section on the 1950s and 1960s television show, *Omnibus*, funded by the Ford Foundation (Alistair Cooke was the main host), Bernstein presented numerous topics and musical events—how Beethoven constructed his Fifth Symphony, performance of his own jazz composition, definition of jazz, the art of conducting (illustrated with Brahms' First Symphony), and the development of musicals. He was a talented and articulate teacher who explained difficult musical concepts with clarity, enthusiasm, humor, and deep knowledge. Teachers should use his methods as a model for instructing young gifted children about all musical genres.

The composer Aaron Copland used exciting programmatic music in the ballets *Appalachian Spring* and *Billy the Kid*. Both of these compositions demonstrate the energy and power of different American cultural and historical groups. Copland, a native of Brooklyn, New York, was interested in expressing American folk music in symphonic form. Both he and Bernstein were colleagues who wanted to increase understanding of American music at

home and around the world.

Other geniuses of American music that young gifted students should learn about in the history of jazz include Louis Armstrong, Duke Ellington, Count Basie, Benny Goodman, Artie Shaw, Tommy Dorsey, Ella Fitzgerald, Bing Crosby, Frank Sinatra, and Tony Bennett. Many will also love learning about the rich history of the Blues, originating in the southern United States and migrating to urban centers where they assumed new forms and styles. Evolved from African spirituals, work songs, revivalist hymns, rural fife and drum music, and other sources, the Blues offers a wide range of music to explore—from Ma Rainey and Bessie Smith to John Lee Hooker, “B.B.” King, “Sonny Boy” Williamson, Muddy Waters, Buddy Guy, and Koko Taylor.

Teachers should also study the lives of Musical Prodigies such as Mozart, Chopin, and Shostakovich to learn the behavioral and motivational characteristics when they were children. What factors in the home affected their development? How did their parents encourage their development as musicians and composers? What incentives did parents provide? Did siblings and other relatives help them to expand their musical abilities? Who were their early teachers, and how did these teachers contribute to their musical growth?

All of these questions can be applied to other fields of knowledge such as mathematics and science. In addition, artistic prodigies in painting, sculptor, and interior design should receive the same types of analysis, particularly as related to the role of mentors in prodigies' lives. What types of opportunities did mentors provide through apprenticeships and special learning opportunities? At what ages did mentors become important in developing prodigies' skills? What were some fundamental lessons that mentors taught prodigies such as persistence, accuracy, and learning basic knowledge of the field of study?

The answers to these and related questions can be applied to all young gifted children in order for teachers to be insightful and effective.

Examples in Teaching Philosophy

The goal of gifted education is to develop Powerhouse Minds. These minds should have a strong grasp of questions and issues of world civilizations that have occurred over thousands of years. Therefore, it is important for young gifted children to learn about basic philosophical questions. Their Powerhouse Minds will be stimulated and expanded by these types of experiences. Certain basic questions should be addressed in their philosophical studies:

Rigorous Thinking. Both Socrates and Plato emphasized that the truly educated person should “Know Thyself.” This imperative from the two greatest individuals in Western philosophy has stimulated personality studies in psychology and the examination of abnormal behavior in psychiatry. By teaching young gifted children to “Know Thyself,” they will have a better understanding of their motivations and learning in the school and home. By having them explain their motivations and learning interests, they will continue to develop as human beings and outstanding students. This type of emphasis in the classroom concentrates upon what is called the affective areas of learning. But the main goal is to teach young gifted children how to use basic logical reasoning to solve affective problems by means of the Socratic Dialog. This is the teaching method designed and applied by Socrates.

Fundamentals of Learning. At birth, the mind is a “blank slate” according to John Locke and other British Empiricists. Knowledge comes from constant interactions with the external world rather than being born with or automatically developing the ability to reason. The more frequent these interactions, the more powerful will the mind become. This is why high-quality early

experiences are so important because they will lead to higher levels of intelligence. Psychologists and philosophers have been arguing for decades as to whether this is a valid thesis. As with most issues in these academic areas, there has been no clear resolution to this problem. In fact, the great German philosopher, Immanuel Kant, had a completely different perspective. He said the human mind is endowed with fixed categories of thinking abilities and ethical values. He did not believe that these abilities and values were solely determined by environmental experiences.

If teachers use Locke's and Kant's ideas in the young gifted child's classroom, they will be sensitive to how both environmental and genetic factors play important roles in their education. An exceptional philosopher whose work relates to these questions can broaden students' understanding and discovery: W.E.B. Du Bois. Among his many achievements, he gave to the world a profound analysis of racism in America and its relationship to education and to the development and growth of a people struggling for liberty and human rights.

Examples in Teaching History

It is important for young gifted children to study history in order for them to understand how different countries have developed. Comparisons between European and New World countries can be made to show their similarities and differences. It is also important for them to study what motivates different countries to seek expansion and growth, whether they want more land, natural resources, increased energy sources, or more people to work the land and develop new industries. All of these factors can lead to conflict and wars. Teachers need to present challenging examples that show how wars can originate from government corruption, and basic needs and motivations.

Ancient Greek and Modern Historians

Herodotus was the father of modern history but he also included the study of different cultures which today is called anthropology. In this regard, gifted elementary school students could study Native American tribes. Try to choose sources by Native American authors and artists, and explore the possibility of local community groups or organizations that might contribute to students' historical learning.

Thucydides wrote about the conflict between Sparta and ancient Athens. Sparta was a militaristic society while Athens was an intellectual and commercial society. From a similar perspective, elementary students could study the American Civil War as a clash between the agrarian Confederacy and the industrialized American Union.

Edward Gibbon described the rise and fall of the Roman Empire and civilization. Teachers could discuss Roman culture and compare it to the Soviet period in Russia.

Carl Sandburg, besides being a great American poet, wrote a multi-volume biography of Abraham Lincoln. This work described the interaction between his character and history. Teachers could compare Lincoln to John F. Kennedy. They could also compare Kennedy's experiences with PT 109 in World War II with his later interactions with history.

H.G. Wells was a great Master of Science Fiction. He wrote *War of the Worlds*. Gifted students could study this fiction book and the famous movie. In addition, they could learn from his book, *The Outline of History*, about the many challenges of world civilizations.

Examples in the Craft of Acting

It is important for young gifted children to study the craft of acting. The two main reasons are that it represents the combination of ratio-

nality and imagination. It also displays the hierarchy of knowledge from low level action heroes to depictions of the human condition. Each one of the actors and actresses listed here represent examples of these qualities.

Denzel Washington and **Will Smith**. Washington appeared in the movie entitled *Glory* (1989) which depicted the plight of Black soldiers in the American Civil War. Smith appeared in *Concussion* (2015) which featured a Black pathologist who discovered serious brain damage in deceased NFL football players. He defied the NFL leaders by insisting this fact be acknowledged. Both movies illustrate how commitment to a cause can produce improvements in people's lives. This is an important lesson for all young gifted children to learn.

Octavia Spencer appeared in two recent movies that show the dilemmas encountered by Black females. *Hidden Figures* (2016) was about a team of women mathematicians who worked for NASA and contributed important research on space travel. In 2012, she received the Academy Award for *The Help* (2011). The movie concerned Black women in the South who worked as maids and how they demanded to be treated with human dignity. These movies can help young gifted children to stand up against prejudice and discrimination.

Gregory Peck performed in two great films about social prejudice in the United States. The first film was *Gentlemen's Agreement* (1947). It dealt with antisemitism in polite society exemplified by a restrictive clientele policy in public accommodations. Peck portrayed an investigative reporter who wrote a series of articles in a popular magazine that turned the spotlight on this nefarious activity. After this 1947 film, he performed in another iconic film about prejudice in America. The name of this film was *To Kill a Mockingbird* (1962). It portrayed a courageous White lawyer in a small Southern

town who defended an innocent Black man accused of murder. Both of these films demonstrated how a decent human being can have a great impact on society. Young gifted children will be inspired to emulate these heroes.

The **Cinematic Musical** was one of the greatest contributions made by the United States to world culture. Judy Garland performed in two of the iconic films of this genre. The first was *The Wizard of Oz* (1940). This film was a blend of social satire, fantasy, and entertainment. She sang one of the most famous songs in the English language, "Over the Rainbow." The second iconic film was *Meet Me in St. Louis* (1944). This film shows how an American family was affected by the World's Fair of 1904. Garland sang two famous songs in the film, "Meet Me in St. Louis" and "The Trolley Song."

Two other musicals can bring diversity and breadth to the study of cinematic musicals. One is *West Side Story* (1961) starring Natalie Wood and directed by Jerome Robbins and Robert Wise with music by Leonard Bernstein. Like the stage production, the film loosely follows the Romeo and Juliette story, but reset on the Upper West Side of New York City in the 1950s with its rival street gangs. Many young people will relate to the themes and struggles brought to life [a remake by Steven Spielberg planned for 2020]. The other production worth exploring for its uniqueness and value to history is the wildly popular sung-and-rapped "Hamilton" by Lin-Manuel Miranda and based on Ron Chernow's biography, *Alexander Hamilton*. Though currently no film adaptation exists, the stage production of *Hamilton* was recorded in 2016 with the original cast and will appear in theaters in 2020.

Gifted children will learn about the art of musical performance and composition by studying these movies.

An Example of the Art of Dance

Judith Jamison – Artistic Director and Choreographer, Alvin Ailey American Dance Theater

Jamison was born in Philadelphia in 1943 and grew up in a racially mixed working class neighborhood. While attending public school, she received dance instruction at the Judimar School of Dance under the tutelage of the director, Marion Cuyjet. While she was studying dance as a young girl, she met the dancer, Pearl Primus, who integrated concepts from African dance into the American modern dance movement.

At age 15, Ms. Jamison enrolled at Fiske University in Nashville, Tennessee but did not graduate because she had a far more intense and broader approach to dancing. After she left Fiske she returned to Philadelphia and became a member of the Philadelphia Dance Academy. Later, she attracted the attention of Alvin Ailey who was emerging as a foremost choreographer. He gave Ms. Jamison the opportunity to become the signature performer for his dance creations which combined her physical strengths and the expression of a wide range of emotions.

In 1980 she appeared on Broadway with Gregory Hines in *Sophisticated Ladies* (1981), a tribute to Duke Ellington's musical genius. She also performed with Mikhail Baryshnikov and Ailey's dance company in another musical tribute to Duke Ellington – *Pas de Duke* (1976). After Alvin Ailey's premature death in 1989, she became the director of the Alvin Ailey American Dance Theater. Her autobiography, *Dancing Spirit* (1993), is an expression of courage and heroism as a gifted performer and creator. Judith Jamison's career clearly shows the influence of family and mentors on gifted individuals – Pearl Primus, Agnes de Mille, Alvin Ailey, Gregory Hines and Mikhail Baryshnikov.

Autobiography: Jamison, Judith (1993). *Dancing Spirit*. New York: Doubleday.

Studies in Literature

The great literary works by American and English authors should form the basis for literacy among young gifted students. When they read works by writers such as Mark Twain, they will learn about American humor and the different cultures that form this nation. *The Adventures of Huckleberry Finn* (1885) and *Tom Sawyer* (1876) also teach them about the great Mississippi River and the adventures that can be experienced traveling on it. Mark Twain was a steam boat pilot on the Mississippi and a newspaper reporter in San Francisco. He spared no words in using these experiences to write his novels, stories, and essays. One of his most humorous stories was "The Celebrated Jumping Frog of Calaveras County" (1867), and was his first story that received national attention. All of his works emphasized American humor and irony.

Walt Whitman represented the American character and environment through his poetry. His enthusiasm for the American people and their accomplishments was reflected in *Leaves of Grass* (1855) which he revised throughout his life. It was a celebration of America – showing the work and accomplishments of different social and ethnic groups. His poetry was open-ended without rhyme or consistent meter. But it possessed a rhythm that made the reader enthusiastically attend to each line and topic.

A wonderful poem included in *Leaves of Grass* was "O captain! My Captain!" Whitman wrote this poem as a tribute to Abraham Lincoln. Young gifted children could discuss why Whitman wrote this poem and some of Lincoln's accomplishments.

The shorter works of William Faulkner have a lot of materials that appeal to the sensibility of young gifted

children. "Spotted Horses" (1931) and "The Bear" (1942) are good examples—both interesting short stories. These works give the reader a sense of time, place, and humanity. They also display to the young gifted child the importance of the physical environment to their own human development. The gifted child's sensibility can relate to stories about animals, for example, *Aesop's Fables* (mid sixth century BCE). In addition, these stories by Faulkner are related to books like Kipling's *Jungle Book* (1894) and Anna Sewall's *Black Beauty* (1877).

"Ah! Easily said. I am the son, Mr. Meagles, of a hard father and mother. I am the only child of parents who weighed, measured, and priced everything: for whom what could not be weighed, measured and priced, had no existence. . . ." (from *Little Dorrit* by Charles Dickens).

What is the reason for holding up Charles Dickens as an exemplar for gifted students? It is obvious, based on the involvement of television, theatre and cinema as well as countless readers worldwide, that we are not the only ones impressed by these novels. *Little Dorrit* describes the machinations, corruption, and incompetency of bankers and stock brokers in the 1820s. There is also a good characterization of the impact these economic malignancies have on individuals and society. The main characters reside in a debtors' prison named Marshalsea. Dickens was painfully aware of Marshalsea because his father and family were residents when he was a youngster.

Dickens' social critique in *Little Dorrit* was rooted in a private, emotional, and psychological wound. In spite of this, he was able to become both a public celebrity and one of the greatest writers in the English language. Gifted students will respond to the ability of an author who not only champions social justice, but who also creates literary works and enduring art. What gives Dickens such power and resonance is

his wonderful ability to create characters representing a panorama of humanity.

Little Dorrit's story is related to the present economic crisis. By reading this book gifted students will have a better understanding of the tragedy and suffering that can result from this type of crisis. Instead of being incarcerated in debtors' prisons, millions are now imprisoned by mortgage foreclosures, severe credit card debts, and lost retirement funds. Charles Dickens was not a politician or economist; he was a creative genius and humanitarian.

Among Dickens' later admirers were such British social critics and political philosophers as G. K. Chesterton and George Orwell. Gifted students will benefit by comparing the works of all three authors. They will also perceive *Little Dorrit* as a masterpiece that resonates with contemporary American society. Through this classic, students can explore more contemporary novelists and poets of all ethnicities and backgrounds who are addressing similar issues.

**Emily Dickinson (1830-86) –
Prolific New England poet with a reclusive disposition.**

Only seven of her 1,775 poems were published (anonymously) during her lifetime. Her poetry is noted for its plain words and lines that have deep metaphoric meanings. Dickinson's unrequited genius was finally recognized in the 1950s and 1960s when all of her poems were finally published.

"Hope" Is the Thing With Feathers (Number 254, c. 1861)

Hope is the thing with feathers—
That perches in the soul—
And sings the tune without the words—
And never stops—at all—

And sweetest—in the gale—is heard—
And sore must be the storm— That could abash the little Bird That kept so many warm—

I've heard it in the chillest land—
And on the strangest Sea—
Yet, never, in Extremity,
It asked a crumb— of Me.

From *America's Favorite Poems* (2000) by Robert Pinsky and Maggie Dietz (Editors), p. 72.

Tell All the Truth But Tell It Slant (Number 1129, c. 1868)

Tell all the Truth but tell it slant—
Success in Circuit lies
Too bright for our infirm Delight
The Truth's superb surprise
As Lightning to the Children eased
With explanation kind
The Truth must dazzle gradually
Or every man be blind—

From *Good Poems* (2003) by Garrison Keillor (Editor), p. 230.

Giftedness as “Intimations of Immortality”

What though the radiance which was once so bright
Be now for ever taken from my sight,

Though nothing can bring back the hour
Of splendour in the grass, of glory in the flower;
We will grieve not, rather find Strength in what remains behind;
In the primal sympathy
Which having been must ever be;
In the soothing thoughts that spring Out of human suffering; In the faith that looks
through death,
In years that bring the philosophic mind.

[From ODE: Intimations of Immortality from *Recollections of Early Childhood*
(1802-04) by William Wordsworth, lines 176-187].

These lines from William Wordsworth became the central theme for the film, *Splendor in the Grass* (1961). The place was rural Kansas just prior to the depression of 1929. The cast included Warren Beatty and Natalie Wood. The writer was the dramatist, William Inge (who also wrote the screen plays for *Bus Stop* (1955) and *Picnic* (1956) and the Director was Elia Kazan. The process of reading and analyzing this particular poem would be an important cognitive and emotional experience for any gifted student.

Giftedness is a basis for “Intimations of Immortality.” Wordsworth uses the term “immortality,” not only in its religious sense but also philosophically and esthetically. The gifted have an understanding of intimations of creativity, beauty, and value. In a similar sense to Wordsworth, a gifted person does not take nature for granted. The rose is more than an object of beauty; it is also an insight into the wonders of creation – thus a confirmation of life.

This poem can help gifted students appreciate on a deeper and more profound level the importance of thought and creativity. In fact, one of the best ways to comprehend the sensibility of giftedness is by studying poetry that has “emotion recollected in tranquillity” (Wordsworth, Preface to the *Lyrical Ballads*, second edition, 1800). Scientific creative minds such as Isaac Newton and Albert Einstein functioned with a similar sensibility. Another English Romantic poet, John Keats (1795-1821), who was influenced by Wordsworth, continued this sensibility of “Intimations of Immortality.” In his poem, *Ode on a Grecian Urn* (1819), Keats wrote an immortal line that has continued to resonate with his readers. “Beauty is truth, truth beauty,” - that is all/ Ye know on earth, and all ye need to know.”

Instead of using a “tricky dog” format of creative skills games to teach the gifted, there are many exemplars of the creative sensibility that exist in such poets as Wordsworth and Keats.

Resource: *Selected Poetry of William Wordsworth*. (2002). Mark Van Doren, Editor. New York: Modern Library.

E. Paul Torrance (1915-2003): Master Educator and Teacher of Creativity

One Of the most important contributors to educating gifted children has been the creativity pioneer and prolific author, E. Paul Torrance. In his many books and papers, he stressed the importance of educating all children to think and solve problems in a flexible manner by seeking numerous alternative solutions. The learning atmosphere in the gifted classroom should emphasize the production of creative problem solutions rather than giving correct answers.

Torrance's ideas on developing creativity have been influential in schools worldwide. The gifted classroom would benefit greatly from using his creativity model by teaching these children to think of many ways to solve problems in a relaxed and enjoyable atmosphere. All of the recommendations in this article have been influenced by the creative ideas of Dr. Torrance. May his ideas continue to be a positive force in the gifted education field for many years to come.

Maurice D. Fisher was a prolific author, creative thinker and pioneer, and the publisher of *Gifted Education Press* and *Gifted Education Press Quarterly*. Through his immense publishing work, he disseminated creative teaching strategies and resources to thousands of teachers and parents around the world every year. He obtained his doctorate from the University of Virginia in Educational Psychology and Gifted Education.

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Claire Goodowens



Cultivating Creative Environments in the Era of High-Stakes Standardized Testing

by Robin Greene and Ellen Honeck

Standardized testing is at cross purposes with many of the most important purposes of public education. It doesn't measure big-picture learning, critical thinking, perseverance, problem solving, creativity or curiosity, yet those are the qualities great teaching brings out in a student.

--Randi Weingarten, n.d.

Introduction

A teacher's role in developing and nurturing creativity in a culturally responsive environment is essential for student engagement and success (Gay, 2018; Hammond, 2015; McCarthy & Blake, 2017; Schroth, Helfer, Beck & Swanson, 2011). However, since the inception of No Child Left Behind (2002) and its successor, Every Student Succeeds Act (2015), teachers and students have faced the increasing demands of high-stakes testing and the cognitive dissonance that occurs when creativity is in conflict with strict accountability measures. Students need teachers who are able to move within an educational standard and beyond testing to create an environment where they can grow, thrive, and be prepared for solving unknown problems. Giving them complex challenges that require increased mental effort are opportunities for creativity to thrive (Carroll, 2013).

Impacts of High-Stakes Standardized Testing

When learning environments are filled with test preparation, drilled repetition of facts, and devoid of challenges and creative learning, there are both short-term and long-term consequences. In a study focusing on the impact of state testing on schools, educators, and students, Moon, Brighton, Jarvis, & Hall (2007) noted the

following findings (a) educators and students feel significant pressure associated with testing; (b) high stakes testing classrooms negatively affect instruction so that it occurs in service to high test scores; (c) educators and students feel an increased pressure to perform in highly impoverished schools; (d) there is a disproportionate demand for high achievement experienced by students in poverty as compared to those in the suburbs; (e) gifted and talented students feel a greater need to perform at higher rates so as to bring up all scores, which results in their disengagement from learning. When students become disengaged and/or face increased pressure, overall achievement declines and creativity is stifled.

In another study, researchers sought to understand the long-term impact of a test-driven learning environment on a students' ability to think creatively and solve problems. This study showed that such students are "unlikely to develop creative thinking skills" needed for college and the workplace (McCarthy & Blake, 2017). Specifically, students who were in the school system for 12 years where test-taking skills and test-specific content were emphasized did not show the ability to develop or sustain creative thinking skills (McCarthy & Blake, 2017). In the current testing situation, with demands from curriculum, educators, administrators, and law-makers, gifted

learners and their motivation are suffering (Hennessey, 2004, 2016; Smutny & von Fremd, 2008)

Creativity at its Roots

The root form of the word creativity is "create." Create means "to grow;" and in education and psychology, there are multiple definitions and theories regarding what it means "to grow" (Amabile, 1996; Csikszentmihalyi, 1996; Guilford, 1950; Lubart & Sternberg, 1998; Piirto, 2004; Renzulli, 1992; Simonton, 1999; Torrance, 1962). Whether teachers adhere to one theory of creativity such as Guilford's and Torrance's ideational fluency, flexibility, and originality, or they create their own definition based on multiple theories, one truism remains: creativity is found in all domains, content areas (Kaufman, 2013) and cultures (Kaufman & Sternberg, 2006; Lubart, 2010; Rudowicz, 2003; Simonton, 2011).

It is important for teachers to see themselves as creativity scouts and seek to nurture and develop creative and critical thinking. They must understand how culture adds to an individual or group's ability to express their creativity (Lubart, 2010). An art teacher who notices a student's innovative approach to using multimedia must support that approach and foster the child's potential, finding the next Van Gogh, Banksy, or

graffiti artist. Math and science teachers should cultivate creativity to develop the future Jonas Salks, Percy Julians, Rosalind Franklins, and Katherine Johnsons of the world. Lastly, and just as importantly, educators should nurture creative thinking and encourage one another to teach creatively (Smith & Smith, 2010). This everyday form of creativity is observed in the simplest of moments when a teacher creates differentiated access points for authentic learning, responds to every day social-emotional needs, or teaches creativity to his or her students (Lubart, 2010).

Being creative does not mean that an individual must be eminent, like some of the individuals above who have what is identified as Big-C (Beghetto, Kaufman, & Baer, 2014; Csikszentmihalyi, 1996; Kaufman & Sternberg, 2010). Instead, it may be seen as everyday creativity or little-c (Beghetto, Kaufman, & Baer, 2014; Csikszentmihalyi, 1996; Kaufman & Sternberg, 2010). As Piirto (2004) stated, "Creativity is the basement, the underpinning, the foundation for talents to be realized" (p. 38). It is the teacher's job to nurture, cultivate, and tend to that foundation so that students are able to grow.

Developing a Creative Environment

Creativity can be fostered within any environment, and every student can be taught creative thinking and problem-solving skills (Beghetto, Kaufman, & Baer, 2014; Renzulli, 1992; Schroth, 2018; Smutny & von Fremd, 2008; Torrance, 1962, 1972). Fostering creativity does not mean that this will produce the next eminent artist; however, it will develop characteristics that are needed to survive in the 21st century. Partnership for 21st Century Learning developed a framework for 21st century learning in order "to define and illustrate the skills, knowledge, expertise and support systems that students need to succeed in work, life and citizenship" (Battelle

for Kids, 2019, p. 1). The framework focuses on learning and innovation skills that include creativity and innovation, critical thinking and problem solving, communication, and collaboration. It is designed to help schools go beyond content only academics and high stakes testing in order to foster students' skills for success in life and work environments.

Teachers have a difficult role balancing the academic, intellectual, social, and emotional lives of individual students. Classrooms and content need to meet the needs of the learners in each setting and be culturally responsive to them. In order to foster creativity in any environment, it is critical for teachers to establish a safe and encouraging space for all students (Gay, 2018; Hammond, 2015). There are multiple components and considerations for a creative classroom including psychological safety, support and focus on intrinsic motivation, and various opportunities to pursue personal interests and passions, engage in quiet reflection, and explore materials and ideas.

Psychological Safety

The first, and most significant aspect of the classroom is to ensure that it is culturally responsive (Gay, 2018; Hammond 2015; Ladson-Billings, 2014). Creating a culturally responsive classroom involves meeting the psychological needs for belongingness and esteem so that students become self-actualized and autonomous learners. These elements within the environment allow creativity to flourish across all cultures. (Davis, 2010; Gay, 2018; Hammond, 2015).

Additional elements of psychological safety include focusing on respect of ideas and each other through empathetic understanding and focus on creative thinking and output. Feedback from educators needs to enhance the relationship and promote students' esteem, worth, and ability (Starko, 2013).

Support and Focus on Intrinsic Motivation

Amabile (1996) found that intrinsic motivation can be productive in terms of general creativity. Research has shown that extrinsic motivation may or may not be harmful to creativity, so teachers should not limit rapid fire feedback and external feedback about projects and assignments. But allowing students to struggle is also important and strategies can be offered without leading to quick solutions. Questions should help students formulate answers and/or provoke their thinking. Student engagement within a learning process or task provides opportunities for intrinsic motivation to shine.

Opportunities to Pursue Personal Interests and Passions

Classroom environments need to provide students with the opportunity to try new things, explore various topics, and explore personal passions. Teachers are in a position to support self-initiated questioning and learning and not dismiss "off task" questions. Instead, educators can ask learners to connect their questions to the original topic by saying, "Tell me more about what sparked your question." If the questions seem unrelated to the topic, then teachers could ask students to write them down and then review the questions with them at a later time. Allowing for student autonomy and engagement is critical to make learning meaningful. This exploration and independent engagement foster joy and happiness in the learning process (Csikszentmihalyi, 1996).

Engage in Quiet Reflection

Students benefit from opportunities for quiet reflection. This is important for exploring internal ideas (Piirto, 2004). Educators can create space for both creativity and quiet reflection by incorporating activities, regardless of content area, such as journaling, coloring, painting, draw-

ing, crafting, yoga, and mindfulness exercises. During this time, teachers can play music or leave the classroom silent. These activities can be done as an anticipatory set before a lesson, as a break during an assignment, especially if students get “stuck” solving a problem or arriving at a solution, or at the end of the lesson/unit as a way to express themselves in relation to the experience they just had.

“Meditation has long been known to work on quieting the mind and body, and to make one receptive to the inner speech that facilitates creativity” (Piirto, 2004, p. 435). Mindfulness meditation—specifically Open Monitoring meditation where students are open to any thoughts that enter their mind and accept those thoughts without judgement—has the opportunity to generate creativity tenets such as flexibility, fluency, and originality in students (Colzato, Ozturk, & Hommel, 2012). Purposeful, quiet reflection pushes out the noises of the day and allows the metacognitive voice to take over. Students may need scaffolds to access this piece of themselves and teachers should be patient with their ability to engage in quiet reflection. Consider starting with smaller segments of time (one to two minutes) and then ease into longer amounts of time throughout the day (five to fifteen minutes).

Teachers should also model reflective and metacognitive practices for their students *while* they are also reflecting; therefore, if educators ask students to reflect before starting an activity through the act of drawing or writing, they should also draw or write in front of the class. This small practice of modeling leaves a large imprint on students and enforces the significance of quiet reflection in the classroom.

Exploration of Materials and Ideas

Creativity relies on the process of exploration, through physical materials as well as ideas. Throughout this process, it is important to engage in and

experiment with new materials. Understanding and engaging in imaginative play fosters creative thinking and using materials can provide these types of opportunities. Materials do not need to be expensive and may include recyclable items (plastic bottles, lids, cardboard tubes), natural materials (leaves, rocks, twigs), art supplies (crayons, paints), craft supplies (popsicle sticks, thread, material, buttons), office supplies (paperclips, erasers, pencils) among other items.

Creative exploration should also focus on ideas and thoughts; therefore, questioning can be helpful. It engages students in the higher level and creative thinking needed to explore and manipulate ideas. One very popular creative thinking technique is called SCAMPER. Each letter of SCAMPER stands for a different aspect of engagement within the idea or material.

S - substitute - Can I substitute a material or idea?

C - combine - Is there a way I can combine this with something else?

A - adapt - How can I adapt this idea?

M – modify, magnify, minify

P - put it to another use

E - eliminate something

R – rearrange.

Application of Environmental Principles

The environmental components of creativity can be applied in multiple ways and can stand as independent as well as layer on each other. When thinking of lessons, units, and topics of discussion, creativity can be fostered throughout the environment with consideration and value of the purposes.

In this example, the SCAMPER technique is used.

SCAMPER with the Community Food Bank

S - substitute

Could we substitute canned goods with fresh produce? What possible outcomes could occur with the substitution?

C - combine

How might we combine the food bank with the after-school program and the night shelter? Can we combine the food bank with community events?

A - adapt

How could we adapt the marketing of the food bank so that more families in need are able to access food?

M - modify, magnify, minify

How would we magnify the impact of the food bank on the community? Is there a way that we can minify the stigma of receiving food from the food bank?

P - put to another use

Could we put the food bank to another use after typical operating hours? What would we use it for?

E - eliminate

If we eliminated food with allergens, how would the food supply be impacted?

R - rearrange

What would be the effect of rearranging the organization of the aisles in the foodbank?

The example is built on the focus of exploring ideas. However, the recognition and development of a psychologically safe environment and the opportunity for quiet reflection are critical when diving into real-world topics. Students have many ideas and thoughts that need to be shared, and teachers need to foster an environment that allows these to surface without any fears about being “right.”

Conclusion

Fostering creativity in a culturally responsive environment is critical to the development of students as citizens of the 21st century. At its core, standardized testing promotes convergent thinking and has a significantly larger impact on those “who attended schools in low-income and predominantly ethnic-and racial-minority neighborhoods—exacerbating long standing inequities in the opportunities and access to quality education afforded to traditionally underserved students” (Beghetto, 2010). With these measures, the excellence gaps grow and students are indeed left behind.

Much to many a teacher’s dismay, accountability mandates that barriers to creativity are not going away anytime soon. When educators create a safe space where they integrate the strengths of students’ cultures, incorporate quiet reflection, and allow students to explore materials, then motivation and engagement increase. When doing these practices, teachers are finding ways to infuse creativity into the curriculum and environment so that creativity is not an afterthought or addendum but an integral layer of the “pedagogy”.

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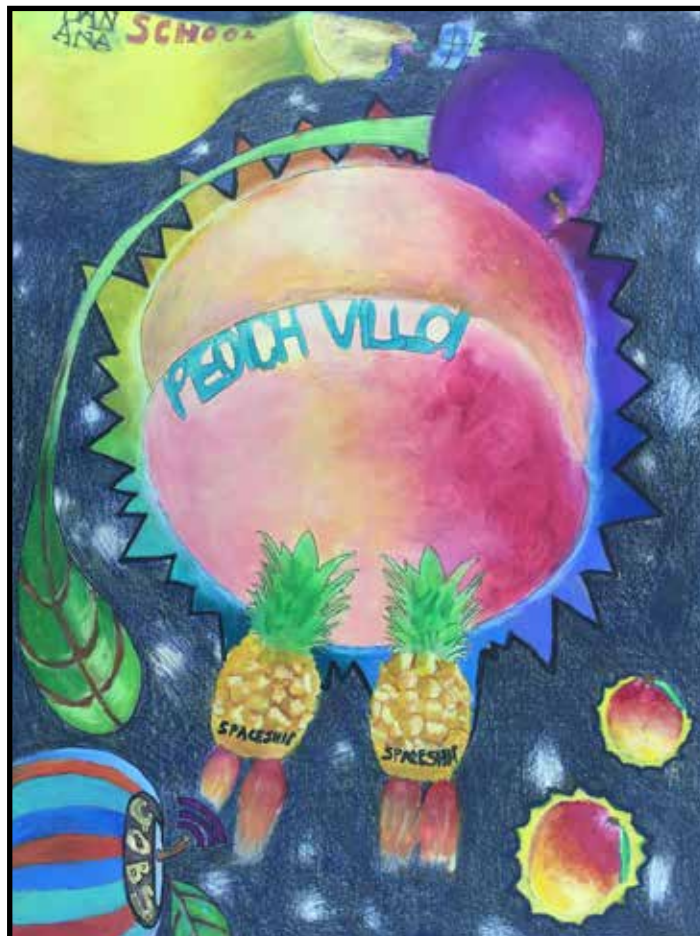
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Developing Creative and Critical Thinking Skills in Diverse Young Learners: Synthesizing Knowledge to Create Optimal Learning Environments

by Stephen T. Schroth and Ocie Watson-Thompson

Introduction

Public schools in the United States are admired by school administrators and leaders in many other parts of the globe. This admiration stems from American schools' success building young learners' critical and creative thinking skills. Yet, exposure to curriculum and instruction that supports critical and creative thinking skills is often denied diverse learners, including children of color, English language learners, and students from low-SES backgrounds. These disparities often stem from two distinct but related misconceptions on the part of classroom teachers, gifted education specialists, and administrators. First, academic excellence is often seen as a prerequisite for children to receive exposure to critical and creative thinking skills. This is not the case. While certain academic skills such as reading fluency and some facility with numbers are certainly important, they do not determine a child's ability to engage in activities requiring critical and creative thinking. Second, many teachers, administrators, and schools have emphasized literacy and numeracy at the expense of much of the rest of the curriculum. Fields of study such as art, music, dance, theatre, and social studies have been especially hard hit, with many children, and especially diverse learners, receiving little or no ex-

posure. As these disciplines are especially useful for teaching critical and creative thinking skills, their omission from the curriculum is troubling to those who are interested in developing these ways of thinking in all children, especially those from diverse backgrounds.

This article shall examine some helpful ways to ponder critical and creative thinking skills, including thoughts on the origins of critical and creative thinking; their relationship to such concepts as intelligence, motivation, and the arts; and methods that teachers, administrators, parents, and others can use to support children in developing these skills. Clearly, due to space limitations there are perspectives and viewpoints that will not be represented in this article. Similarly, the activities, instructional strategies, and supports suggested to develop and build critical and creative thinking skills in diverse learners provide only a starting point, but one that will hopefully encourage some educators who have not previously used such tools to try them for the first time.

Critical and Creative Thinking

In 1950, at his American Psychological Association (APA) presidential address, Guilford identified creativity as an attribute that was very important to an individual's develop-

ment and thinking, but one that was also neglected by researchers and scholars (1950). Beginning with the launch of Sputnik, interest in critical thinking exploded, with Bruner emphasizing the need for children to explore the "fundamental ideas of a discipline" insofar that they will be able to gain both skills and a general sense of understanding (Bruner, 1960, p. 3). For the past half century, educators have acknowledged that critical and creative thinking skills are important, but have often struggled to provide children with educational experiences that buttress and build these ways of thinking (Plucker, 2016). One reason that instructional sequences for supporting critical and creative thinking are so scarce is perhaps the lack of consensus about what precisely critical and creative thinking are.

Academic attainment is often seen as a combination of creativity, intelligence, and wisdom. *Creativity* has been defined in various ways over the years. Sternberg defines creativity as, "the potential to produce novel ideas that are task-appropriate and high in quality, best understood in a societal context terms of a dialectical relation to intelligence and wisdom" (2001, p. 360). Although definitions of *intelligence* vary widely, almost all share a view that it involves individuals using their natural skills and gifts to adapt to the environment in which they find

¹ We realize that many educational "reformers" insist that one need not worry about children's understandings, as these cannot be measured. We respectfully assert that such policy makers are wrong, and that Bruner was right.

themselves (Sternberg, 2001). *Wisdom* involves a person's ability to synthesize the theses of intelligence (Sternberg, 2001). At its essence, creative thinking involves the ability to invent products that are both of high quality *and* novel (Sternberg, 2001). The aspect of novelty stretches the definition beyond the products that intelligent individuals might make, and pushes the edges of the discipline to craft something new, useful, and unexpected (Csikszentmihalyi, 1996).

Critical thinking is related to creativity, but different in substance and scope. *Critical thinking*, Bruner posited, involves understanding a subject in a manner that permits many other things to be related to it meaningfully (Bruner, 1960). Curiously, in opposition to many current fads in education, such as the Common Core State Standards (CCSS), Bruner believed that children will often learn how to use formal operations in mathematics and other fields *before* they fully understand them or can even identify them (Bruner, 1960). Part of the difficulty of helping students engage in critical thinking are content standards that expect all children of the same age to be grappling with the same subject matter. It is imperative that there be some variety in the curricula so that *each* child has an appropriate level of challenge (Bruner, 1966). *Instruction* is chiefly an effort to assist or foster a child's growth and to cultivate excellence (Bruner, 1966). Teaching that recognizes and responds to the structure of the discipline assists both the less able and the gifted child to "achieve their optimum intellectual development" (Bruner, 1966, p. 9).

Children thus must be exposed to the structure of the disciplines that they study (Bruner, 1960; 1967; Renzulli, 1988; Tomlinson et al., 2008; Treffinger et al., 2004). Teachers, even those who work with very young children, must understand that they are not just teaching the three R's, but instead English, arithmetic, algebra, geometry, astronomy, biology, chemistry, physics, economics, geography, history, political science, and the like (Renzulli & Reis,

2014; Smutny & von Fremd, 2010; Treffinger et al., 2004). Educators who grasp the importance of teaching the structure of the discipline are better able to understand knowledge, both as it relates to the subject and "as it exists at different points in the development of the child" (Bruner, 1966, p. 7). Children's intellectual growth and increasing ability to engage in critical thinking results from the confluence of teaching, learning, familiarity with the language and procedures of the disciplines, and development (Bruner, 1966). Unless all of these factors exist, better critical thinking will not occur.

Critical thinking has increasingly become a skill that American schools want their students to master (Aguirre et al., 2013; Brown, 2011; Schneider, 2018). Although faced with various competing responsibilities and obligations, teachers are nevertheless expected to build these skills in their students (Schroth & Helfer, 2018). By explicitly teaching critical and creative thinking skills and then designing instructional sequences that enable children to use them, teachers can increase proficiency (Smutny & von Fremd, 2009; Treffinger, Schoonover, & Selby, 2013). Such instruction is especially important for diverse learners, who may lack opportunities to engage in these processes outside of school settings.

Intelligence, Motivation, and the Arts

To the extent intelligence involves selecting and shaping environments, it is creativity (Ochse, 1990). While sophisticated assessments of intelligence first came into common use over a century ago, tests that measure creativity have taken much longer to develop (Sternberg & O'Hara, 1999). Though some maintain that creativity is merely a subset of intelligence, others suggest there is no relationship between the two (Sternberg & O'Hara, 1999). As a result, it is imperative that all children be exposed to activities that support the acquisition, enhancement, and refinement of their creative talents, as their performance in other subjects

may have little or no relationship to them (Smutny & von Fremd, 2009; Treffinger, Schoonover, & Selby, 2013).

Many myths surround creativity. A long-surviving myth associated creativity with madness, implying an increased likelihood of mental instability among those who were especially creative, such as artists, musicians, and others; this has been debunked, as these individuals have proved no more likely to exhibit mental health issues than anyone else (Collins & Amabile, 1999). Similarly, many believe that creative individuals are motivated to work and will continue on projects for hours with little regard to time (Collins & Amabile, 1999). Studies have indicated that intrinsic motivation is more conducive to creative endeavors than extrinsic (Sternberg & Lubart, 1996). When an individual invests his or her time in identifying a problem and then devising a number of solutions, this happens because of his or her intense interest in the subject matter (Collins & Amabile, 1999; Csikszentmihalyi, 1990). For teachers, this means that students are much more likely to be motivated and engage in creative behaviors when they pursue topics they love (Collins & Amabile, 1999; Torrance 2002).

For this interest in learning to occur it is especially important to respect the learners' home language and culture. Content should not be compromised or diluted and there must be increased interactions with peers and others. These students should have experiences that enhance and extend their critical and creative thinking skills. Current research has found that diverse learners tend to be motivated when the content has a human, social focus and teaching strategies that involve them with other people. Instruction must be based on the same principle of high expectations for all students.

In an effective classroom environment, knowledge is constructed through active engagement in learning activities where students of diverse cultures feel welcomed and encouraged to become a community of leaders. To meet their needs and promote practices

that encourage them to perform their best, teachers must have some knowledge of cultural traditions and values. It is critical to understand possible differences in behavior as well as appreciate those differences. As facilitators of an inclusive learning environment, teachers can be more cognizant of cultural variations and mindful of these variations while planning and implementing instruction. According to Gay (2018), there are five essential elements of Culturally Responsive Teaching:

1. Developing knowledge about culturally diversity
2. Including ethnicity and cultural diversity content in curriculum;
3. Demonstrating caring and building learning communities;
4. Communicating with ethnically diverse students; and
5. Responding to ethnic diversity in delivery of instruction.

When these elements are present, diverse learners are much more likely to perform in a way that permits creative production.

The value of the arts and impact on academic achievement cannot be minimized. There are studies that support the role of the arts on the motivation to learn, on critical as well as creative thinking of students engaged in arts-related experiences. Catterall, Dumais, and Hampden-Thompson (2012) conducted a study that examined data from the National Educational Longitudinal Survey (NELS). The study observed the relationship between students' involvement in the arts and academic success. This quantitative study "showed that the probability of having more arts experiences in school was greater for economically advantaged students than for low-socioeconomic status students" (Catterall et al., 2012, p. 17). Students from low socioeconomic

environments exposed to the arts on a regular basis performed consistent with students from higher-income communities (Catterall et al., 2012). One of the examples given was students involved in band and orchestra; these students received higher scores than others on the NELS math assessment. Additionally, students who participated in drama demonstrated higher scores on reading proficiency.

Deasy (2002) has suggested that when artists create work that engages others emotionally, the artists experienced self-emotions. The arts provided stimulation to the brain for both the creator and the end consumer of that art (Deasy, 2002). Deasy concluded, "Through research the brain had been found to physically change when any type of learning takes place. The change was tremendous and overriding when emotion was part of the learning" (Deasy, 2002). When teachers create learning environments that acknowledge this and make use of children's emotions, the opportunities for growth increased markedly.

Ways to Support Children's Critical and Creative Thinking

Over 45 years ago, Torrance identified teaching children the approaches, processes, and procedures associated with Creative Problem Solving (CPS) as one means of building critical and creative skills (Torrance & Torrance, 1973). CPS is especially attractive to teachers, coordinators, and administrators for several reasons. First, a wealth of materials, developed over five decades, exist that can help educators introduce CPS to children and then continue to develop their proficiency using the processes over time. Second, CPS applies to any age group, with any subject, and with any population of children, including those with special needs and those identified as gifted and talented. Third and last, CPS can adapt to meet the skills and needs of children as well as the adults who work with them. The entire system may be used, or just selected parts, depending upon

the situation and time available for the process. As such, CPS is highly flexible and practical, and should be part of the toolkits of all educators seeking to build and refine the critical and creative thinking skills of children.

First developed during the 1950s by Parnes and Osborne, CPS is a proven way of building the creative thinking and problem solving skills of learners of any age (Osborn, 1963; Parnes, 1967; Treffinger, Isaksen, & Stead-Dorval, 2006). CPS remains a flexible and dynamic process (Treffinger, Isaksen, & Stead-Dorval, 2006; Treffinger, Selby, & Schoonover, 2013). Those using the process can begin at any point and may revisit those parts as necessary (Schroth et al., 2011; Treffinger, Isaksen, & Stead-Dorval, 2006). CPS consists of four main components and eight specific stages that work in unison or individually (Treffinger, Isaksen, & Stead-Dorval, 2006). The components consist of Understanding the Challenge, Generating Ideas, Preparing for Action, and Planning Your Approach (Treffinger, Isaksen, & Stead-Dorval, 2006). The specific stages are framing problems, exploring data, constructing opportunities, generating ideas, developing solutions, building acceptance, appraising tasks, and designing process (Treffinger, Isaksen, & Stead-Dorval, 2006). A variety of tools exist to help with each of the stages, such as brainstorming, SCAMPER (i.e., substitute, combine, adapt, modify, put to another use, eliminate, and reverse), ALoU (i.e., advantages, limitations, overcome limitations, and unique features), and a host of others (Treffinger & Nassab, 2000).

As mentioned, CPS can be used with students of any age, with any subject, and at any time (Schroth et al., 2011; Treffinger, Isaksen, & Stead-Dorval, 2006). A third-grade teacher, for example, whose students are studying continuity and change, may use a variety of CPS strategies and tools as part of that process (California Department of Education, 1998). If her overarching goal is that students demonstrate basic economic reasoning skills and understand

the local economy, she might suggest that they work in groups to develop a product using resources appealing to local consumers. To begin this process, the children engage in a brainstorming exercise, generating many possible products, inviting unusual options, withholding criticism of ideas presented, and freely combining ideas to create new options (Treffinger & Nassab, 2000; Treffinger, Selby, & Schoonover, 2013). Once they compile a list of possible products, the students could use SCAMPER to hone and improve some of the more popular ideas, this time engaging in a more critical approach (Treffinger, Isaksen, & Stead-Dorval, 2006; Treffinger & Nassab, 2000). Finally, when they select one or two of the most popular products, the children might use ALoU to analyze each of these and determine the one for producing a prototype (Schroth, Collins, & Treffinger, 2011; Treffinger & Nassab, 2000).

Torrance also suggested that exposure to the arts and to programs that teach and practice creative thinking were positive ways to build both critical and creative thinking skills in children (Torrance & Torrance, 1973). The Visual Thinking Strategies (VTS) approach helps children interact with visual art, encouraging an acquaintance with the creative arts and practice in creative thinking, both of which Torrance believed were so crucial to their development (Torrance, 1962; Torrance & Torrance, 1973; Yenawine, 2013). VTS offers a research-based method for engaging with visual art—easy, inexpensive, and enjoyable—that many leading art museums use (Yenawine, 2013). Teachers, coordinators, and administrators who seek ways to build critical and creative thinking skills in children will find VTS useful, especially due to its value when working with diverse populations.

The process for using VTS is simple. The teacher selects a piece of visual art to show the children. While the choice of the artwork lies completely with the teacher, experience has shown that representational artworks of a somewhat narrative nature tend to

work best, especially for young learners (Yenawine, 2013). The artwork can be in any form, such as a print, an image on a transparency for use with an overhead projector, or a digital art work projected on a screen or SmartBoard. The art piece is shown to the children with little introduction, and they look at it for a minute. The teacher then proceeds to ask the children variations on three questions:

1. What's going on in this picture?
2. What else do you see? And
3. (In the case of an interpretive answer) What makes you say that? (Yenawine, 2013).

As the children answer, the teacher repeats children's responses and points out features that children have noted. When a child makes an interpretive response, such as "The girl looks sad," the teacher asks the child to explain why he or she feels that way.

Initially, students will list items they see in the piece. As they become more familiar with the process, however, children begin to make more interpretive responses and to include their knowledge of art theory and composition in the discussions. They also become much more attentive to the responses of their peers and include these answers or rejoinders in their comments. Yenawine (2013) posits that several benefits result from children participating in VTS:

1. Looking more carefully at works of art;
2. Talking about what they observe;
3. Supporting their ideas with evidence;
4. Listening to and considering the thoughts and opinions of others;
5. Discussing, considering, and deciding upon a variety of opinions and perspectives.

All of these benefits greatly support the development of critical and creative thinking skills. When teaching diverse learners, there is an advantage to gaining exposure to a variety of great works of art. Teachers who are especially attuned to the interests, readiness levels, and learning profiles of their students will be sure to include art of special appeal to the children they teach (Tomlinson, 2003; 2014; Torrance, 2002).

Conclusion

Teachers must assure that certain conditions and environments are in place before they can expect children, especially those from diverse backgrounds, to engage in critical and creative thinking activities. Happily, a variety of programs and strategies can help teachers to involve students from all backgrounds in those activities and behaviors that will permit them to grow their critical and creative problem-solving abilities. Below in Table 1 are a variety of resources that will assist teachers, coordinators, and administrators interested in using some of these strategies with the children they serve. Many of these resources are free or relatively inexpensive, permitting a teacher to use them in the classroom or a principal to initiate such a program at his or her school without inordinately expensive material costs.

More important than resources, however, is the desire to initiate instructional experiences that develop critical and creative thinking skills and the drive to work through the inevitable problems that arise. Such initiatives may prove difficult, given the landscape of top-down content standards and scripted curriculum that seem to place greater demands upon teachers than there are minutes in the day. Nonetheless, those teachers committed to the "patient pursuit of the possible" will gladly work to find the time within their day to provide the children they serve with the opportunity to engage in critical and creative thinking skills (Bruner, 1966, p. 23). Such efforts will be rewarded with increased on-task time, more motivated

learners, and classrooms where learning environments better represent the cultures of the children served within them. By providing the joy that Torrance felt was so important for children to experience, teachers who initiate such programs and see them through to maturity will enjoy the fruits of having done their job and done it well (Torrance, 2002).

Table 1.
Resources for Teaching Critical and Creative Problem Solving Skills

Resource	Author/Location	Use
The Metropolitan Museum of Art	https://www.metmuseum.org/art/collection/	Over 400,000 high resolution Open Content images from the Met's collection that permits teachers, parents, and students to locate, download, and use drawings, paintings, and other artworks
Igniting Creativity in Gifted Learners, K-6: Strategies for Every Teacher	Joan Franklin Smutny and S. E. von Fremd	Tremendous sourcebook that provides ideas for developing creativity in young learners
Creative Problem Solving: An Introduction (4th ed.)	Donald J. Treffinger, Scott G. Isaksen, & K. Brian Stead-Dorval	An explanation of and toolkit for using the Creative Problem Solving approach with students of any age
The Differentiated Classroom: Responding to the Needs of All Learners (2nd ed.)	Carol Ann Tomlinson	Wonderful introduction to differentiated instruction
Torrance Creativity Awards	http://www.centerforgifted.org/torrance.html	International competition celebrating student excellence in creative writing, the visual arts, music, and inventions
Planning Differentiated Instruction & Assessing Results: Teaching to Assure Each Student's Success	Stephen T. Schroth, Jason A. Helfer, Diana L. Beck, & Barry L. Swanson	Introduction to planning instruction to assure student growth in mixed-ability classrooms

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Alexander Durreuce



Incubating Mathematical Creativity Through a Molecular Gastronomy 101 Saturday Enrichment Camp¹

by Connie Phelps

This article addresses creative applied mathematics used outside the regular education classroom. It examines universal themes and standards of mathematics through the pedagogical framework of the Torrance Incubation Model of Creative Teaching and Learning (TIM) during a university-sponsored Saturday Enrichment Camp for gifted and talented learners. Enrichment camp instructors included experienced gifted facilitators, parents of gifted children, and grown-up gifted children who volunteered their time, energy, culinary expertise, and specialized equipment to explore three modern culinary techniques in a three-hour molecular gastronomy class for gifted and talented learners ages 8-14 years. The hands-on Saturday Enrichment Camp with real world application required participants to apply mathematics and technology to prepare a three-course meal using seasonal locally sourced farm food ingredients from a rural Midwestern community in the United States.

Mathematical Creativity and Giftedness

Young learners identified with gifts and talents typically receive specialized instruction for core academic subjects including reading and math in public and private schools. Qualified school personnel assess gifted learner potential in these subjects using a variety of standardized instruments to determine academic potential and need

for modified curricula. When placed in gifted services, students then receive individualized instructional plans designed to address their exceptionalities. Content standards in academic subjects determine expected outcomes, and individuals with gifts and talents may function several grade levels above their chronological age ability. In mathematics, for example, identified gifted learners may receive enriched and accelerated instruction above grade level so they continue to learn and develop advanced potential.

Hoeflinger (1998) found identification of mathematically precocious students an elusive process, as they may underachieve in the regular education classroom, show little interest or effort during math instruction, or score below their potential on achievement tests. Moreover, when classroom teachers teach only basic formula and rules, mathematically gifted learners miss opportunities to demonstrate their creative thinking processes. A common characteristic of mathematically gifted children relates to their ability to grasp multiple layers of complex problem-solving and suggest a variety of solutions or strategies to solve a problem. Students with academic giftedness in mathematics view the world through a mathematical lens, interpret scenarios embedded with mathematical language, create graphs and tables to solve problems, and use manipulatives to explain processes. They ask *why* and conduct their own inves-

tigations to prove their point (pp. 244, 246).

Kozlowski, Chamberlin, and Mann (2019) reviewed characteristics of mathematical giftedness and operationalized mathematical creativity as a psychological construct blending fluency, flexibility, originality, and elaboration as indicators (p. 506). They examined mathematics and creativity within the Wallas Gestalt Model of Creativity with its four stages of preparation, incubation, illumination, and verification with their respective associations between conscious and unconscious processes. Despite the complexity of defining domain-specific mathematical creativity and its unconscious processes, they found considerable research addressed quantifying creative thinking abilities. Kozlowski et al. (2019) advocated research to examine the relationship between teaching methods and the role of student affect toward mathematics in the classroom.

Torrance Incubation Model of Teaching

In 1996, E. Paul Torrance developed the Incubation Model of Teaching (TIM) with its three interactive, sequential stages to support creativity in the classroom (Hébert, Cramond, & Neumeister, 2002). The model supported teachers during lesson planning, delivery, and extension with a menu of instructional strategies for each

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of the three stages. Stage One, *Heighten Anticipation*, served as a warm-up with six functions in lesson planning; Stage Two, *Deepen Expectations*, embedded problem-solving processes with eight strategies in lesson delivery; Stage Three, *Keeping it Going*, extended learning with real world applications with five metaphors to inspire creativity to extend the lesson. This study proposes the TIM to bridge the gap between psychological constructs of creativity, instructional strategies, and student affect during a range of learning experiences outside the classroom. School budget reductions in programming, less school staff to deliver modified services for high ability learners, and concerned parents seeking talent development opportunities for their children increase the need for out-of-school enrichment experiences. This study examines mathematical standards, concepts, relationships, and applications during the Saturday Enrichment Camp through the pedagogical framework of the TIM. Similar to the grassroots *makerspace* movement of “hands-on making, creating, designing, and innovating” (Peppler & Bender, 2013, p. 23), the Molecular Gastronomy 101 enrichment camp blended community involvement, high interest, and creativity through a range of activities and variety of assembly materials.

Saturday Enrichment Camps

Saturday Enrichment Camps for gifted and talented children provide out-of-school experiences to explore high interest areas with real world applications as a group in a supportive environment. Infused with higher-level thinking and creative problem-solving skills, enrichment camps provide a single-focus academic or creative experience designed to stimulate their intellectual curiosity for further exploration after the camp. Although school districts, universities, academies, and museums often sponsor enrichment camps, various organizations, businesses, and community groups also possess facilities and expertise to offer enrichment programs. Saturday enrichment programs include

a series of camps on consecutive Saturdays during an academic semester—a morning or afternoon of several hours duration with multiple sessions within each camp. Camp programs organize sessions by clustered ages or grade levels sessions conducive to common interests and cognitive ability. This environment provides hands-on engagement essential to support social, emotional, and cognitive growth in a non-competitive environment without homework or grades.

Enrichment programs provide excellent opportunities otherwise unavailable in schools for diverse gifted learners to learn and practice academic *thinking dispositions* needed for success in life and as career explorations at young ages. In mathematics, thinking dispositions such as *perseverance, thinking and communicating with clarity and precision, thinking flexibly, thinking interdependently, and remaining open to continuous learning* found in the Habits of Mind (Costa & Kallick, 2008) prove useful. Broad-based thinking dispositions relate well to more specific discipline-based ways of thinking and behaving. For example, the National Council of Teachers of Mathematics (NCTM) Evaluation Standard 10 Mathematical Disposition advocates confidence, flexibility, perseverance, inventiveness, reflection, valuing, and appreciation of mathematics as both a tool and a language (NCTM, 1989, 2000). Moreover, mathematics content standards support universal themes and generalizations for change, conflict, exploration, force or influence, order, patterns, power, structure, systems, and relationships (Kaplan & Curry, 1985). Combined with innovative culinary techniques, mathematical standards and themes required creative planning, careful preparation, and evaluation of practices. For example, community supported agriculture (CSA) flexibly delivers seasonal food products despite unpredictable weather conditions that affect crop growth and harvest. Some molecular gastronomy techniques depend on lightweight food substances that require digital scales to measure ratio-based amounts accurately.

The outcome of a three-course molecular gastronomy meal calibrates technology correctly to cook and hold foods at precise temperatures.

Molecular Gastronomy 101

Molecular gastronomy represents a type of modern cuisine based on distinct flavor sensations created during physical and chemical transformations of manipulated foods. In the late 1980s, French agricultural scientist Hervé This experimented with thousands of transformations in molecular gastronomy designated as the *scientific study of cooking*. A classic study examined the impact of temperature on eggs using *sous vide* or “under water” technique with a low temperature immersion circulator. Other molecular gastronomy techniques include *spherification* of substances for a caviar effect, creating foams with a whipping siphon or immersion blender, flash freezing with liquid nitrogen to make ice cream or to shatter fruit, food dehydration, powderization with maltodextrin, and infrared sensors to monitor cooking times. This experimentation provided the foundation that transformed culinary arts used in high-end restaurants throughout the world.

Michelin three-star Chef Ferran Adrià of the former elBulli in Spain manipulated food flavors to infuse rose scent into mozzarella cheese, combine melon and ham, and create pine nut marshmallows. Chef Grant Achatz of the three-starred Alinea in Chicago blended fruit flavors and inverted sugar to create his iconic edible helium-blown balloon signature dessert. Former Chef Homaro Cantu of Moto restaurant in Chicago served edible paper menus constructed of corn and soy, laser cooked fish, and used the West African *miracle berry* to sweeten sour foods. Chef Cantu also transformed crabapples, cactus, and hay ingredients from his backyard into barbecued steak. These chefs achieved game-changing innovations in the culinary world based on investigations in science labs. World-class chefs represent

celebrity status, and the plethora of cooking shows on television attest to the appeal of culinary arts for children as well as adults. Moreover, the culinary market now provides affordable equipment and products needed for molecular gastronomy cooking techniques for the home chef. These culinary advancements demonstrated the universal themes of *change* and *growth* in mathematics (Kaplan & Curry, 1985). The Saturday Enrichment Camp challenged campers to use applied mathematics creatively and innovatively as they encountered new technology and ratio-based “recipes.”

Stage One Heightening Anticipation

Months of behind the scenes preparations set the stage for the Saturday Enrichment Camp. The warm-up phase included a variety of physical, mental, and social activities designed to get *attention* for a “problem” to solve and stimulate curiosity about the subject. The “problem” targeted out-of-school enrichment experiences, and a group of gifted facilitators from a local school district met with the Director of Gifted Education at a nearby university to organize its first Saturday Enrichment Camp, “Molecular Gastronomy 101.” Considering school events and holiday breaks, they selected a Saturday in late April, multiple grade levels three through eight, affordable cost, convenient location at the university without charge, camp curriculum, and duration of three hours. The gifted facilitators notified parents of gifted students at in their respective schools, and the Director of Gifted Education announced the enrichment camp during a Faculty Senate meeting. A university graduate assistant designed a camp flyer with essential information and created a booklet including the camp schedule, class content, vocabulary, and camp instructor biographies. As an innovative camp experience, prior knowledge and skills only required the ability to use standard measuring spoons and cups,

read digitally displayed information, follow a series of sequential steps in a procedure, and understand the concept of ratios.

As an initial effort, the Saturday Enrichment Camp included volunteers to keep costs affordable yet provide funds for future enrichment camps. For example, a retired Gifted Coordinator who co-founded a Summer Enrichment Camp in a large school district served as registrar. A grown up gifted Honors College student took photographs. Several school-based personnel assisted with small group rotations through three molecular gastronomy techniques. A parent of gifted children with expertise in molecular gastronomy led small group explorations. A professional chef who taught a molecular gastronomy class at a regional culinary center mentored the project from start to finish. A parent donated chicken, corn, and blackberry juice products from her local farm, and local gifted facilitators assisted with food preparation. The camp director secured college grant funding to purchase farm vegetables and greens from a local farmer and maltodextrin, and agar from Amazon.com.

The Teachers College provided classrooms at no charge, and the camp staff stored perishable dairy products in the faculty lounge refrigerator. Without traditional kitchen equipment, they secured a former science lab classroom with a deep sink to vacuum “hand press” plastic bags under water for sous vide and used its extended countertop to prepare and cook foods. The Saturday Enrichment Camp delivered an intensive experience infused with applied mathematics experienced creatively throughout the program. The pre-camp experience identified and motivated potential campers, their parents, teachers, and camp staff by marking their calendars for the Saturday Enrichment Camp. The coordination of activities with parts that worked together and involved subsystems related to the

universal mathematical theme of *systems* (Kaplan & Curry, 1985) with campers learning in whole groups, applying skills in small groups, and evaluating progress individually.

Mathematical dispositions (NCTM, 1989, 2000) form a significant element in assessing giftedness and creativity. The Molecular Gastronomy 101 enrichment camp provided an out-of-school experience for camp instructors and staff to observe approximately 15 high ability students in whole group learning and hands-on small group exploration settings. Campers demonstrated mathematical dispositions to solve problems and communicate ideas; flexibly explore mathematical ideas and try alternative solutions; persist in tasks requiring precise mathematics, approach mathematical tasks with curiosity; reflect on their own performance; value mathematical applications in other disciplines; and appreciate mathematics in their own culture. For example, campers explored ratios by quantity and quality of food ingredients evaluated by taste, color, and size in a meal course and recorded observations in their camp booklets. They assessed timing required for droplets of juice into containers of chilled vegetable oil to form encapsulated spheres at the desired size and shape. They reflected these dispositions through verbal and written comments in booklets.



Stage Two: Deepening Expectations

The Molecular Gastronomy 101 enrichment camp consisted of two parts: whole group community supported agriculture (CSA) demonstration and small group exploration of three molecular gastronomy techniques. During the whole group demonstration, a local farmer discussed the farm to fork movement and CSA as a system with shareholders supporting a small farm operation. The presentation included a demonstration of microgreens as a simple way to grow vegetables for any meal. The farmer guided campers as they planted sprouted sunflower seeds and cut microgreens for the salad course in the three-course luncheon. When campers planted small sprouted seeds at the correct depth for optimal growth, they observed the relationship between size, texture, and shape from the fully-grown microgreens they washed and dried for the salad starter course.

The whole group demonstration also introduced three molecular gastronomy techniques used in the three-course luncheon: sous vide, spherification, powderization. Sous vide cooks food in a vacuum-sealed plastic bag at a slow constant temperature. Sous vide requires an immersion circulator to heat and circulate water to a precise and constant temperature. Powderization transforms food textures with maltodextrin and a high-fat liquid like olive oil or Nutella spread into a flavorful powder. *N-Zorbit* contains *maltose*, a food additive similar to starch. Spherification encapsulates liquid food substances such as juices or oils into spheres using Super Agar, a form of agar agar derived from red sea vegetables used to thicken foods. Campers experienced the universal mathematical theme of *relationships* during the whole group farm to fork and molecular gastronomy demonstrations through *purposefulness* (Kaplan & Curry, 1985) as they prepared microgreens for the salad starter course and gained knowledge needed to

plan the main and dessert courses. They understood these innovative culinary practices required mathematics applied creatively.

The whole group “deepening expectations” phase presented mathematical problems of planning, securing, and purchasing ingredients for a three-course meal. They estimated the element of time needed for innovative techniques such as sous vide as well as freezing and thawing food items. During small group hands-on explorations, campers determined preparation time by verifying food temperatures during the spherification technique requiring cold vegetable oil to encapsulate liquid substances. They understood the relationship of cooking time and temperature needed to cook chicken and eggs safely to a precise temperature using sous vide and a non-touch infrared digital thermometer.

Stage Three: Keeping It Going

After the farm to fork whole group demonstration, campers *extended learning* through hands-on small group explorations culminating in a high-class three-course culinary experience. Campers formed small groups in the former science lab room, wore aprons, practiced knife skills under supervision, selected flavor profile ingredients, and rotated through exploration stations, thus experiencing applied mathematics creatively while learning molecular gastronomy techniques. A bonus technique featured a whipping siphon using nitrous oxide to quick freeze ice cream for dessert. Students used modern culinary experiences to assemble the three-course meal with a microgreen salad starter dressed with spherified olive oil and blackberry juice pearls, sous vide cook the main course chicken with lemon slices and fresh herbs served with spring vegetables and corn side dishes, and a frozen ice cream dessert topped with powdered Nutella spread.



Campers used multiple senses to create flavor profiles with fresh lemon, garlic, rosemary, thyme, butter, and olive oil, as well as salt and pepper, for sous vide chicken. They selected, crushed, and chopped seasonings by size, shape, and color to provide a pleasing blend of flavors. They released droplets of blackberry juice and olive from a plastic squeeze bottle into vegetable oil chilled in tall cylindrical glass jars transformed into salad dressing “pearls.” They evaluated the taste and texture of tender sous vide chicken, corn, and spring turnips. Throughout the hands-on small group rotation, campers observed and practiced *mis en place* with culinary utensils and equipment ready for use and removal as a demonstration of the universal mathematical theme of *order* (Kaplan & Curry, 1985).

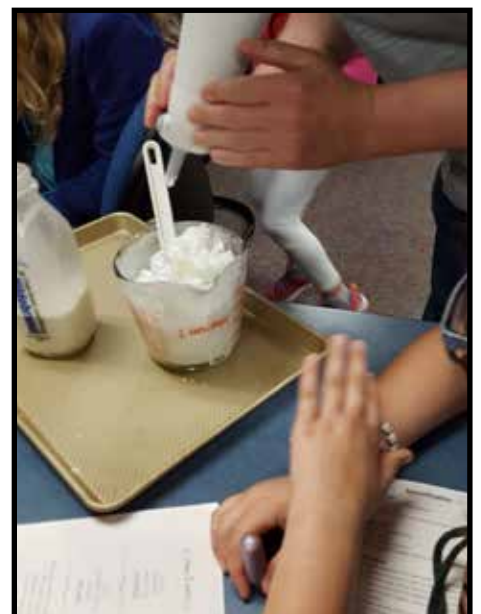
Mathematical applications in the hands-on exploration groups included measuring the lightweight substances of N-Zorbit (maltodextrin) required for powderization and Super Agar used during spherification. Campers used food ratios, rather than standard recipes, to transform food flavors into new shapes and textures. They relied on their sense of taste and smell to season sous vide chicken in vacuum compressed and sealed plastic bags. Sous vide immersion circulators cook and hold chicken and eggs at precise and constant temperatures needed for food safety. Campers observed infrared digital thermometer readings to check doneness of sous vide chicken and eggs in the water bath containers.

Conclusion

The Saturday Enrichment Camp “Junior Chefs” used individual camp booklets to take notes, record impressions, and research culinary references for further study. For example, they could further explore fantastic applications of molecular gastronomy practiced at three-star Michelin restaurants or enjoy every day applications to cook eggs precisely with their enrichment camp “recipes” at home. Upon

completion of the Saturday Enrichment Camp, Junior Chefs reflected upon the benefits of Community Supported Agriculture and impact of the farm to fork movement on their local community. They spoke to parents and siblings of “the best chicken they ever ate,” slow cooked without traditional kitchen methods requiring a stovetop or oven. Junior Chefs received digital badges through email acknowledging their achievement preparing a three-course meal using molecular gastronomy techniques, demonstrating team-building skills, and building individual flavor profiles. Based on evaluations, the Saturday Enrichment Camp leadership team planned Crime Scene Investigator (CSI) and Entrepreneurship enrichment camp experiences in subsequent years.

The three-stage TIM pedagogical framework provided a richly layered creative out-of-schools learning experience that generated multiple opportunities for Junior Chefs to view, examine, and assess culinary facts, concepts, and principles as creative and gifted mathematicians. Junior Chefs solved reality-based mathematical questions in order to cook a high-class three-course meal. As a result, they experienced applications of mathematics in areas where the use of mathematical methods might seem less obvious. They gained an impression about the influence of mathematics on an activity such as cooking that might superficially seem more creative rather than strictly logical. Through a variety of mathematical tasks used for a range of culinary activities, Junior Chefs observed a creative usage of mathematics as they investigated knowledge and skills needed to perform the range of culinary tasks. As a specialized type of community-based makerspace, the project demonstrates real-world learning outside the classroom as Junior Chefs practiced applied mathematics creatively, collaboratively, and communicatively.





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Stella Lee



Digital Creative Problem Solving: The Beyonders Program

by Kathy Goff, Erik Guzik, and Rex Jung

Though interest in STEM/STEAM is increasing as a component of K-12 education, the connection of STEM/STEAM to such critical 21st century skills as creative thinking remains unclear. Does increasing focus on STEM/STEAM diminish opportunities for students to exercise their creativity? Or might STEM/STEAM open new avenues for creativity in the K-12 classroom? This article will explore the concept of STEM/STEAM in reference to 21st century learning skills—specifically, creativity and innovation, digital learning, creative problem solving, collaboration, and communication. We explore a pilot digital creative problem-solving program, the Beyonders Program, along with preliminary research into its impact. The Beyonders Program includes a pre/post creativity assessment along with team challenges for secondary students. We believe that focus on STEM/STEAM offers new opportunities to increase student creativity and other 21st century skills.

STEM/STEAM

The National Science Foundation developed the acronym of STEM for science, technology, engineering, and mathematics. STEM is an inquiry-based program that incorporates teamwork and instruction in the “soft skills” needed for business and industry (The Partnership for 21st Century Skills, 2007). In addition, STEM integrates curriculum and instruction, thereby removing boundaries between subjects (Morrison & Bartlett, 2009). In this way, STEM acts as a transdisciplinary vehicle for overcoming the

compartmentalized approach to education (Holley, 2009).

Indeed, in terms of this key transdisciplinary element in STEM, recent innovative thinking has relied on breaking down the distinction between disciplines traditionally seen as “creative” like the arts or music and STEM subjects traditionally seen as more rigid or logical-mathematical (Catterall, 2002; Henriksen, 2014). For example, the art element (A) of STEAM is often referred to as creativity in education (Land, 2013; Sousa & Pilecki, 2013). Art has proved to be a valuable instructional tool for integrating STEM into the regular curriculum as well as engaging students in the social and cultural contexts of science and technology (Kuhn, Greenhalgh & McDermott, 2016). The involvement of the arts provides a more complete knowledge and skill base for learners to develop the most effective solutions possible.

As such, STEAM is an essential paradigm for creatively infused teaching and learning in STEM disciplines. The concept of STEAM suggests a need to celebrate and encourage the development of creativity by allowing students to use original and artistic ways to express knowledge (Barber, King & Buchanan, 2015).

There are a number of K–12 STEAM programs. Characteristics of quality STEM/STEAM programs include the following (Jolly, 2014):

1. The context is motivating, engaging, and real world;
2. Students integrate and apply meaningful and important mathematics and science content;
3. Teaching methods are inquiry based and student centered;
4. Students engage in solving challenges using a problem-solving process;
5. Teamwork and communications are a major focus. Throughout the program, students have the freedom to think critically, creatively, and innovatively, as well as opportunities to fail and try again in safe environments.

According to Turner (2013), STEM/STEAM education is not just an area of study, but a way of teaching and learning that is project-based, collaborative, and focused on solving real-world problems. STEM/STEAM programs educate the whole student, emphasizing innovation, problem solving, critical thinking, and creativity. Oner, Nite, Capraro, and Capraro (2016) found that secondary students believe that STEM careers require creativity.

As such, the very structure of STEM/STEAM programs, especially their integrative approach to learning, suggests an important opportunity for even greater focus on creative thinking in the classroom. Using creativity can

establish the interdisciplinary concepts found in STEM as well as engage students in learning. In addition, creativity can serve as a means for students to express their understanding of STEM content. Indeed, according to Boy (2013), creativity cannot be treated separately from STEM, and Mote, Strelecki, and Johnson (2014) note that the use of creativity in STEM activities has grown.

The benefits of consciously applying creative thinking to a STEM based curriculum are many. Students apply learned information to creatively address a problem they have not yet encountered (Roberts, 2012). Those involved in integrated problem-solving curricula display increased engagement, satisfaction, and enjoyment (Havice, 2009). Teachers agree that students are more immersed in learning when it includes one or more creative modalities (Gullatt, 2007). Taken together, STEM and a conscious focus on creativity in the classroom offer a potent combination to improve educational outcomes and better prepare students for 21st century occupations.

Creativity and Innovation

Creativity is a vital ingredient in meeting the challenges of a continuous life cycle, a cycle in which growth and change are the norm from conception onwards. A life filled with growth and change requires a conscious effort to think creatively. To develop creativity, the mind needs to be exercised as well as filled with materials out of which to form ideas. The richest fuel for ideation is firsthand experience (Osborn, 1963). Anytime one is faced with a problem or dilemma with no learned or practiced solution, some creativity is required (Torrance, 1962;1988;1995). The 2010 IBM Global study of 1,500 CEO's selected creativity as the most crucial factor for future success.

Fostering creativity in education is vital. Research demonstrates that activities requiring creative thinking result in positive outcomes (Oner, et al,

2016). Problem- and team-based learning provide opportunities for students to develop their creativity, engage in collaborative learning, and increase advanced thinking skills (Hargrove, 2011).

Creativity and innovation are linked through the purpose of producing something of value that can be traded, developed, and commercially exploited. Innovation is the application of a creative solution with a profitable outcome (Serrat, 2017).

E. Paul Torrance

Dr. E. Paul Torrance was a pioneer in creativity research and education for more than 60 years. He produced over 1800 publications and presentations on creativity (Millar, 1997). Torrance chose to define creativity as a process because he thought it could be used to predict what kinds of people could master the process, what climates could make it grow, and what products could be involved (Torrance, 1995). Torrance created a battery of tests of creative thinking abilities for use from kindergarten through graduate and professional education. The *Torrance Tests of Creative Thinking* (TTCT) (1966) are the most widely used assessments of creative talent in the United States and have been translated into over 50 different languages.

Torrance (1979) found that learning and thinking creatively take place in the process of sensing difficulties, problems, gaps in information; making guesses or formulating hypotheses about these deficiencies; testing these guesses, revising and then retesting them; and finally, communicating the results. Vital human needs are involved in each of these four stages.

Creative Problem Solving

Torrance's research demonstrates that a variety of techniques for training in creative problem solving produce significant growth without interfering with traditional kinds of

educational achievement. Creative growth seems to be the greatest and most predictable when deliberate, direct teaching of creative thinking skills is involved (Torrance, 1995).

Caswell (2006) describes it as an approach to finding workable answers to problems that exist in real life. Creative problem-solving skills operate at the most general level and can influence performance in any domain (Amabile, 1989). Problem-solving activities shift the focus of the class to a student-centered orientation that provides a more creative and interactive environment (Yen & Lee, 2011). These skills can be influenced by training and experience. Torrance (1957) found that elements of a creative solution can be taught, but the creativity itself must be self discovered and self disciplined.

There is a big difference between getting ideas and doing something about them. An idea all by itself does not mean much unless it relates to people and things. The value of ideas comes in their application. In creative problem solving, students work in groups to creatively solve a problem that generally has no known or pre-determined solution (Caswell, 2006). Creative problem solving is a teaching method that incorporates active learning strategies to engage students in working with complex situations (Samson, 2015).

A key way to engage students is to integrate active learning strategies into the curriculum (Delialioglu, 2011; Hayden, Ouyand, Scinski, Ollsterwski, & Bielefeldt, 2011). Active learning strategies that incorporate student collaboration and are challenging with timely feedback help increase both learning and academic achievement (Delialioglu, 2011). Creative problem solving is an effective strategy to motivate and inspire students. It promotes deeper learning and fosters the development of critical thinking skills (Samson, 2015).

Problem Based Learning

Problem Based Learning (PBL) is an instructional and curricular, learner-centered approach that empowers students to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem (Savery, 2006). It is a strategy that enables students to learn while actively examining meaningful problems (Yew & Goh, 2016).

Hmelo-Silver (2004) described PBL as an instructional method where students learn through facilitated problem solving that centers on a complex problem without a single correct answer. Students work in collaborative groups to identify what they need to learn in order to solve a problem, engage in self-directed learning, apply their new knowledge, and reflect on what they learned and the effectiveness of the strategies employed (Savery, 2006, p. 12).

PBL fosters the ability to identify the information needed for a particular application, where and how to seek that information, how to organize it in a meaningful conceptual framework, and how to communicate it to others (Duch, Groh, & Allen, 2001, pp. 6-7). PBL teaching methods increase the creative thinking skills of students (Ersoy & Baser, 2014).

Problem-based learning is differentiated from traditional, lecture-based instruction by employing a real-world problem that engages learners in active exploration rather than providing them with passive reception of lecture material (Peterson, 2004). The underlying assumption is that through the process of engaging with the real-world problem the students learn.

Deslauriers, Schelew, and Wieman (2011) confirmed that students become enthusiastic when experiencing problem-based learning. Studies of PBL in online environments indicate that

learners develop higher-order thinking skills, have more motivation to participate, and become more active learners (Şendağ & Odabaşı, 2009; Delialioğlu, 2012).

Collaboration and Communication

Collaboration is about shared meaning and vision. It is a purposeful relationship formed to solve a problem, to create, discover, change or review something. Collaboration involves sharing responsibilities; it involves each team member being equal and contributing to the process. According to Sawyer (2007, p.7), collaboration drives creativity because innovation always emerges from a series of sparks – never a single flash of insight. Students learn about themselves in collaborations. They learn to identify their strengths and talents as well as increase self-esteem by sharing and achieving a common goal.

Collaboration is a core concept for creativity that requires expertise in a wide range of domains (Karakaya & Demirkan, 2015). As an innovative activity, team members engage in a shared process of exploration. Collaborative learning is the joint construction of meaning, understanding, and knowledge, based on elaboration and evaluation of group members' ideas and thoughts (Chen, Gao, Yan & Xu, 2015).

Creativity is a collaborative process where the members of the team produce a new and useful output for the group or wider community (Chen, et al, 2015). When learning in teams, students interact with their peers with effective communication (Morrison & Bartlett, 2009). During the collaboration process, students not only learn to respect each other, they also develop self-regulation in order to contribute to the project tasks (Kuo, Hwang, & Lee, 2012; Trilling & Fadel, 2009).

Communication is an essential part of creativity. Once a solution is found the creators are compelled to communicate it. Creativity is the “c” in communication (Boy, 2013). In order to collaborate, they must communicate well enough to ensure that their work together will flourish and lead to more productive and creative solutions. The quality and level of communication among team members is an effective assessment of the success of their collaboration (Shen, Ony & Nee, 2010).

Technology

21st century and problem-based learning skills include the development of creativity, self-motivation, innovation, problem-solving, and collaboration skills (Kaufman, 2013). The three factors of problem-based learning, authentic assessment, and meaningful community are a powerful combination of tools that online instructors can use to provide students with effective digital

Positive outcomes from a collaborative learning environment include

1. increased levels of achievement
2. feeling better about themselves when given opportunities for success and self-expression
3. learning to deal with differences and to show respect for the contributions of all group/team members
4. learning to recognize each other's strengths by communicating their experiences and ideas
5. gaining practical experience with people who are culturally, academically or physically different from themselves, which then enables students to accept difference in and outside of the classroom.

pedagogy (Barber, King & Buchanan, 2015).

Without creativity, the process of developing technological solutions to the problems we face in society is limited to the replication of old solutions (Cropley, 2015). In order to find the solutions that can solve new and old problems, creativity is required (Torrance, 1995).

Digital technologies can create a new type of cyber-learning environment—an environment that effectively targets creative thinking and problem solving within the classroom. They hold the unique potential to be replicated and extended across the globe in a cost-effective and wide-ranging manner. The impact of such a digital environment may be transformative in the classroom and bring a wider range of higher-level thinking skills to a global population.

Technology-rich activities can sustain high levels of student engagement and peer collaboration compared to less technology focused activities (West, 2013).

Jonassen (2000) and Jonassen, Strobel, and Gottdenker (2005) have identified the effective use of technology in supporting creativity and problem solving. Such technology includes what are often referred to as Mindtools.

Jonassen's research suggests that Mindtools play an important role in promoting the problem-solving capacities of students and providing a fertile environment for student engagement and cognitive growth. The technologies that Jonassen and others identify, however, are not new creativity tools, nor do they focus specifically on the human creative process. Rather, such tools are often software applications, such as spreadsheets, database programs, mind-mapping programs, and so on, that teachers may use with students in new ways. While certainly of great

value in the classroom, such technologies are inherently limited in their ability to promote and assess creative outcomes, as their focus and design do not directly target creative thinking and problem solving.

In addition to Mindtools, some K-12 educators are now experimenting with existing online technologies—especially collaborative software—to promote creative activities in the classroom. Indeed, the growing desire for new web-based collaborative tools is perhaps best illustrated in the increasing classroom use of such social networking sites and applications as Facebook, Twitter, Instagram, Second Life, and Google Docs.

While allowing for valuable new forms of interaction and information-sharing in and outside of the classroom, such software programs are again severely limited by their designed uses and applications. Such programs are primarily intended to allow users to share existing information—not develop, construct, evaluate, and actualize new creative ideas and innovative artifacts.

Beyonders Program

The Beyonders Program is a mobile application developed to better understand and promote the creative process within and beyond the classroom. The Beyonders Program draws together a number of activities directly connected to research and education, with a stated goal of creating a digital creativity system focused squarely on teaching, training and learning.

Specifically, the Beyonders Program seeks to

- apply existing research of human creativity to create a comprehensive digital creativity application
- promote the teaching, practice, and assessment of creativity in the classroom
- train teachers to use the Beyonders Program creativity tools
- promote research into effective creativity models, problem solving, and higher-order cognition
- promote research into information technology and advanced web technologies that might be effectively used in creating cyber creativity environments
- develop digital tools to store and track development of student creativity.

The value of mobile devices is that they allow students to connect, communicate, collaborate, and create through rich digital resources (West, 2013). The Beyonders Program offers groups a comprehensive CPS-based mobile app that utilizes personal tablets for accessing the exercises and projects in the classroom, at home, and in the community. The Program provides an immersive digital learning environment that aims to keep students linked, digitally and figuratively, to active learning throughout the day, in and beyond the traditional classroom.

The Beyonders Program offers participating students the ability to collaborate on assignments and projects, creating what the program refers to as virtual “pop-up classrooms.” Sixty one percent of high school students surveyed thought that collaborating with classmates on real world problems would help them be more successful in science, for example (Project Tomorrow Speak Up Survey, 2013).

Through the Beyonders Program, students participate in activities of scientific investigation and technical design of specific problems, becoming the main investigators and questioners. Investigation, creative thinking, and problem solving are central to science and technology education; they are also precisely the skills that the Beyonders program seeks to promote in grades 6-12 classrooms worldwide.

A growing body of research supports the efficacy of inquiry-based learning on student motivation and engagement (Jonassen, 2011) and student retention and graduation rates (Dynarski et. al, 2008; Kemple & Snipes, 2000). For substantive improvements in student retention and learning outcomes to appear in U.S. classrooms, it is imperative that schools offer authentic learning opportunities connecting classrooms with the broader community. Engaging in 21st century thinking skills like creativity, decision-making, and collaboration must be authentic and meaningful to students, especially as they relate to the workplace.

Beyonders Pilot Research

The term Beyonders is meant to designate individuals in society who exhibit advanced creativity—individuals who move beyond others in terms of the development and application of advanced creative thinking and problem-solving abilities. (Torrance, 2002). The main goals of the Beyonders Program are

1. to engage students in STEM-based, real-world creative problem-solving projects using advanced digital technology (Problem-Based Learning)

2. to develop the creative capacities of 6th-12th grade students so that they realize their potential for creative outcomes and initiate positive individual and social change (21st Century Thinking Skills Development)

3. to systematically research the creative capacities of 6th-12th grade secondary school students before and after participation in the Beyonders Program (Advanced Skills Assessment).

The Beyonders Program is a digital education and research program for secondary students. This online program offers 4 distinct challenges to participants during an academic year. These STEM related challenges include such topics as entrepreneurship, environmental awareness, inventing, improved health, community safety and improvement, and so forth. Students learn creative problem-solving models and apply them to a range of local and global issues. Teams of students develop creative solutions and take action to communicate their solutions. Each challenge is developed and evaluated by trained scorers.

The Beyonders Program provides teams with opportunities to work with students from other regions and countries on global challenges. The Beyonders platform offers synchronous and asynchronous communication tools to facilitate discussions between team members as they work through the challenges.

A pilot of the Beyonders Program was conducted during the 2014-2015 school year at a residential treatment program for troubled adolescent boys ages 11-18. The students were pre and post tested using the VCAI-re (VAST Creative Abilities Indicator - research edition). They participated in 28 one-hour per week sessions, during school hours, between assessments.

Seventy-three percent of the TBH boys (N=27) realized an increase in their creativity scores. The average gain for overall test scores was 17.3 points, an 85% increase between pre and post testing. Overall, the greatest scoring gains were for Fluency (87% gain), Originality (170% gain), Elaboration (81% gain) and Creative Strengths

(78% gain). Flexibility showed little difference between Pre and Post testing.

The SPSS results indicated significant increases ($p < .05$) in fluency, originality, elaboration, and overall creativity as cited in the tables that follow.

Paired Samples Statistics

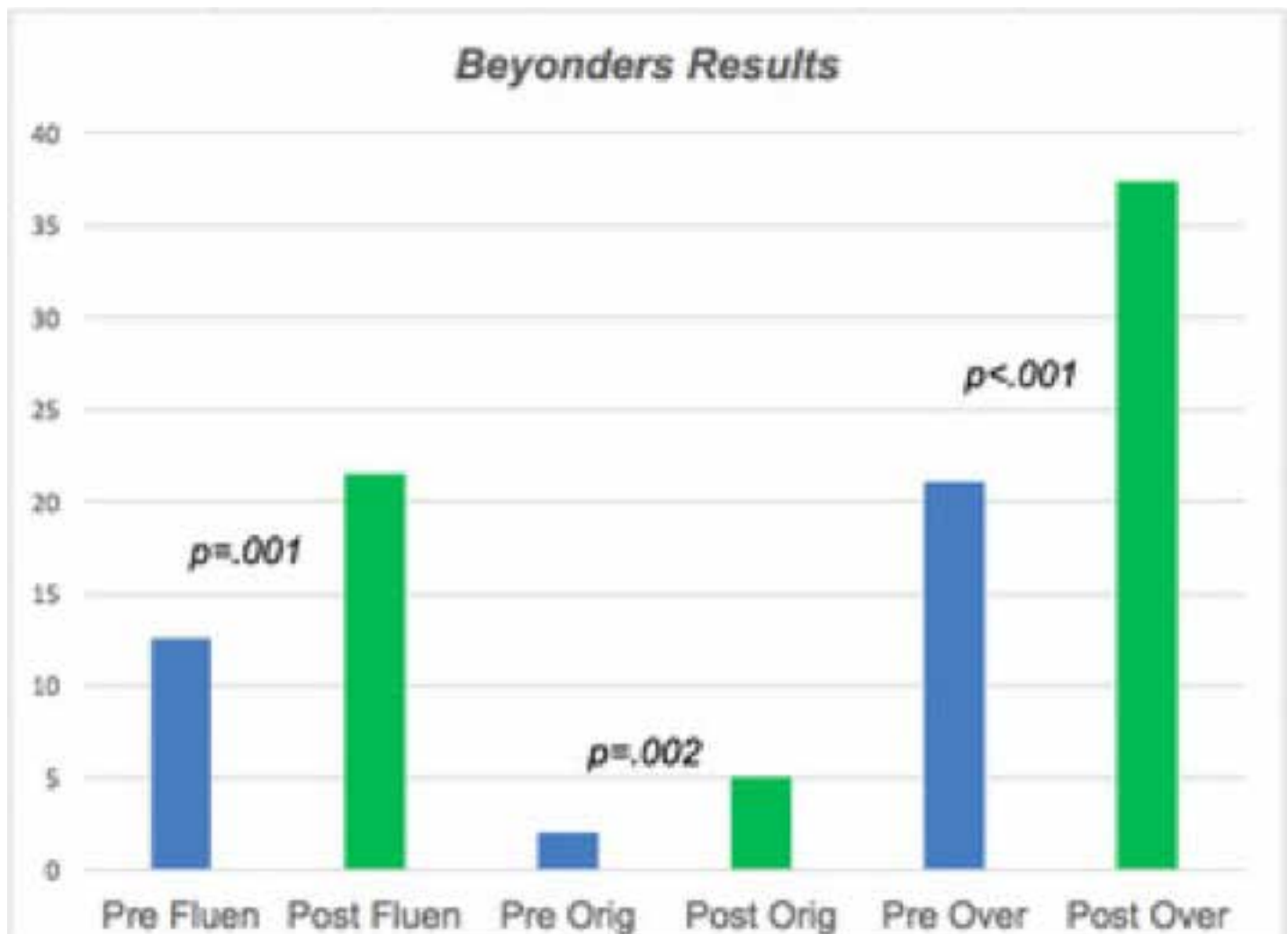
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_Flue	11.63	27	8.858	1.705
	Post_Flue	21.56	27	8.460	1.628
Pair 2	Pre_Flex	1.07	27	1.035	.199
	Post_Flex	.78	27	1.188	.229
Pair 3	Pre_Orig	1.93	27	3.257	.627
	Post_Orig	4.89	27	5.191	.999
Pair 4	Pre_Elab	2.78	27	3.620	.697
	Post_Elab	5.52	27	5.243	1.009
Pair 5	Pre_CS	2.15	27	3.072	.591
	Post_CS	3.85	27	4.035	.777
Pair 6	Pre_Over	19.56	27	14.577	2.805
	Post_Over	36.59	27	16.967	3.265

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre_Flue & Post_Flue	27	.040	.844
Pair 2	Pre_Flex & Post_Flex	27	.108	.593
Pair 3	Pre_Orig & Post_Orig	27	.598	.001
Pair 4	Pre_Elab & Post_Elab	27	.170	.395
Pair 5	Pre_CS & Post_CS	27	.238	.233
Pair 6	Pre_Over & Post_Over	27	.258	.193

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre_Flue - Post_Flue	-9.926	12.003	2.310	-14.674	-5.178	-4.297	26	.000
Pair 2	Pre_Flex - Post_Flex	.296	1.489	.287	-.293	.885	1.034	26	.311
Pair 3	Pre_Orig - Post_Orig	-2.963	4.165	.801	-4.610	-1.315	-3.697	26	.001
Pair 4	Pre_Elab - Post_Elab	-2.741	5.841	1.124	-5.052	-.430	-2.438	26	.022
Pair 5	Pre_CS - Post_CS	-1.704	4.453	.857	-3.465	.058	-1.988	26	.057
Pair 6	Pre_Over - Post_Over	-17.037	19.302	3.715	-24.673	-9.401	-4.586	26	.000



Although this is a very limited study, it does provide encouraging data for continued research and application.

Team Based Learning

Team-based problem solving is a popular and established method of promoting creative thinking among students and has, in the past, served as the basis for a number of successful creativity programs, including Odyssey of the Mind, Destination Imagination, Future Problem Solving, and TASC. Such programs, while certainly important and effective among their target student populations, have suffered from a number of flaws inherent in their deployment models and methods. Such flaws have limited the acceptance and use of such programs as means of promoting creative thinking, even given their admirable goals of promoting higher-order thinking among participants.

Specifically, many existing creativity programs

1. have been geared heavily toward the gifted and talented population, neglecting the wider student population, especially the underrepresented and disadvantaged

2. have often focused on single conceptualizations of creativity and one basic problem-solving model, thereby limiting their application to different curriculum areas and issues, as well as teacher and student needs

3. have not sought to evaluate nor gather research on the impact of their creativity tools in order to better understand the creative process and the particular tools needed to promote human creativity and its products

4. have been designed to focus on predetermined topic areas, usually determined by the supplying organization itself—usage within the classroom has therefore been limited

5. have often been created for use outside of the standard classroom curriculum and have therefore provided little focus on ways of applying creativity tools within the classroom

6. have usually charged fees to participating students and teams for program access (given their extracurricular nature), further limiting their use and application among the broader student population, especially the disadvantaged

7. have not developed a technological component to promote creativity in the K-12 classroom, nor do they currently envision technology as playing an integral role in promoting human creativity and its products in the future.

The Beyonders Program shares with such programs the underlying goals of encouraging creative thinking and problem-solving skills among students. Given its focus on flexible digital technologies, however, the Beyonders Program offers a distinctly different set of methods for promoting and assessing human creativity and its outcomes in the classroom.

Conclusion

Creativity is learning by doing. Collaboration facilitates both solving creative tasks and the development of creativity (Doppenberg, den Brok, & Bakx, 2012). Experimentation leads to creativity. Problem based learning arouses students' curiosity and sparks their creative imaginations and critical thinking (Capon & Kuhn, 2004). Embracing and institutionalizing mobile technology can transform learning (West, 2013).

Students of today—our future inventors, producers, and leaders—will be called upon to explore a host of issues in new ways, evaluate numerous competing ideas, and generate innovative solutions to a variety of unique challenges and situations. The development of more effective, advanced thinking abilities is key to preparing students for competitive and innovation-based environments. Digital technologies present a unique opportunity for schools worldwide to answer the growing need for creative thinking and innovative activities.

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Gifted Learners Enhance Their Creativity Through a Paris Excursion

by Jerry D. Flack

I was a reluctant and poor student in my early education until fifth grade when I was assigned a major project by my new teacher. Each student in the class had picked a state or territory of the USA to investigate thoroughly. Suddenly, I was on fire. After completing my state project on Mississippi, I spent the entire following summer between the fifth and sixth grades learning all about geology, geography, history, culture, national parks, capitals and capitols, and other hallmarks of the remaining 47 states at the time and all for no grades or school credit. My writing skills greatly increased and I found an entirely new genre of reading materials and writing, technical writing, that served me well for the rest of my formal education.

I invented my own creative curriculum.

Learning about individual cities, states, and nations can be a wonderful multi-disciplinary inquiry with considerable attention paid to the hallmarks of creative learning such as brainstorming, creative productive thinking, and creative problem solving. The recommended studies and extensions further offer inventive ways to meet state and national standards. Moreover, such inquiries provide many different and rich pathways students may follow that best match their individual interests and learning styles. One of the great changes that has occurred in the many decades since my fifth-grade introduction to a passion for learning is the Internet. Today, students may use myriad online searches to open their eyes to the glory

of information available almost instantaneously.

Traveling Across the Nation and Around the World

The following outline of a proposed investigation of Paris can serve as a template to serve as a creative passport to studies of any city, state, territory, or 200 or more nations in the world. Specifically, the generic resources and activities in this curriculum model or outline can also serve as a format for organizing geographical and cultural studies as a creative pursuit. Students can investigate the cities and nations of their ancestors. They may seek knowledge about places where they want to spend one or more years of their college education. They may want to learn more about a city, state or nation that would be a dream vacation. It is a great and wonderful nation and world. Encourage gifted learners to delve into studies to become more familiar with their importance.

The Creativity Extensions in this article may be completed by individual students, student pairs and small groups, or as whole class activities.

The fields of study emphasized in this manuscript are creative thinking strategies, problem solving, and world studies. Creative studies include the following prescripts.

Brainstorming

Brainstorming was first articulated by A. F. Osborne in *Applied Imagination: Principles and Procedures of Creative Problem Solving* (Charles Scribner's Sons, 1961).

Brainstorming has four key components.

- Criticism is ruled out.
- “Free-wheeling” (new ideas) are welcomed.
- Quantity is desired.
- Combinations and improvements are sought.

Creative Productive Thinking (FFOE)

E. Paul Torrance was one of the first persons to both teach and test creative productive thinking with its core components of fluency, flexibility, originality, and elaboration. See Torrance's classic *The Search for Satori and Creativity* (Creative Education Foundation, 1979). **Fluency** refers to the ease of coming up with many ideas. **Flexibility** keys in on differences and alternatives. **Originality** emphasizes generating unique ideas. **Elaboration** is the process of exploring alternatives to enhance an idea or make a product more complete.

SCAMPER is an acronym Bob Eberle first articulated in *Visual Thinking: A SCAMPER Tool for Useful Thinking* (D.O.K., 1982). SCAMPER serves as a useful mnemonic tool for developing

even more creative thinking strategies. The key elements of SCAMPER are:

- S** **Substitute**
- C** **Combine**
- A** **Adapt/Adjust**
- M** **Modify, Minify, Magnify**
- P** **Put to other uses**
- E** **Eliminate, Elaborate**
- R** **Reverse, Rearrange.**

Creative Problem Solving

Many innovative thinkers have outlined steps for creative problem solving. The model noted here has been articulated by Donald J. Treffinger, Scott G. Isaksen, and K. Brian Dorval in their book *Creative Problem Solving: An Introduction* (Center for Creative Learning, 1994.) Six stages are spread across three broad components: **Understanding the Problem, Generating ideas, and Planning for action.** Dr. E. Paul Torrance used a similar rubric when he created the Future Problem Solving Program in the 1970s.

Mess-Finding, Data-Finding, and Problem-Finding are the stages of **Understanding a Problem.** Creative problem solvers note that a problem exists and seek data to better understand the “messy” situation. Problem-Finding is the articulation of a specific problem.

Next, problem solvers engage in Idea-Finding (**Generating Ideas**) by using tools such as fluency to come up with many unique and promising possibilities to solve the stated problem.

Planning for action consists of two final stages. Solution-Finding involves choosing the best possible solution to the problem that has been identified. Acceptance-Finding involves

originating a plan of action to implement the best possible solution to the identified problem.

A creative problem solving session might begin with Mess-Finding as students begin to use a **Creative Problem Solving Model** to determine how to best share with others what they have learned about Paris in the 20th century.

The Five Ws

Students can employ journalism’s **Five Ws: Who, What, Where, When, and Why.**

Students use electronic resources to seek online explanations and alternative approaches to these creative tools in their projects and products. Further, they explore Google or other search engines to find additional creative thinking strategies such as Forced Relationships and Attribute Listing.

Why Paris?

Paris is quite possibly the most famous city in the world. It is the once-in-a-lifetime dream vacation destination annually for 50 million travelers from around the world. Paris, also known as *La Ville Lumiere* (City of Light), is a place of study that may also be thought of as the most creative city in the world. It is a most appropriate location for creative studies since *La Ville Lumiere* has at least two meanings. Paris was the center during the Enlightenment when it became the heart of learning, intellectualism, and creativity. Quite literally, Paris is also the most spectacularly beautiful city of light since the invention of electricity. *Joie de vivre* is a French phrase that translates into English as the “Joy of Living.” Creativity obviously flourishes in an atmosphere such as Paris which celebrates such joy.

Paris is also the pinnacle of the world of art containing the world’s largest art museum (*Musee du Louvre*) and the home of the world’s most

famous painting, Leonardo da Vinci’s *Mona Lisa*. Paris is the world capital of haute couture (high fashion) and also the culinary capital of the world. Expatriate writers and artists such as Ernest Hemingway (USA) and Pablo Picasso (Spain) created masterpieces while living in Paris.

The first two-time Nobel Prize winner, Marie Curie, heads the list of Parisian distinguished scientists and inventors. The motion picture camera and projector and the world’s first films were created in Paris. The Metro, the subway of Paris, was the first underground mass transit system in the world.

Many of the world’s most prized, admired, and well-known monuments and buildings are housed in Paris. Paris is also the home of great works of sculpture and architecture. The Luxor Obelisk in the Place de la Concorde, a gift from Egypt (1826) dates back thousands of years to Ramses II’s temple at Luxor. A far more recent example of brilliance in architecture is the glass pyramidal entrance to the Musee du Louvre created by I. M. Pei in 1986. Notre-Dame (Our Lady) is noted as being the first of Europe’s great Gothic cathedrals. The foundation stone was set in place in 1163.

From at least World War I (1914-1918) African Americans have been welcomed to Paris and throughout France as a whole. Black celebrities were embraced by Parisians and experienced none of the ugly racism that once typified much of the United States. Harlem writers such as Richard Wright and James Baldwin and entertainers such as Josephine Baker and Nina Simone were honored celebrities in Paris during the 20th Century. Prior to World War II and Hitler’s invasion of France that included Paris, in 1940, American jazz as performed by African Americans was especially a hit in the City of Light.

Paris is also home to incredible children’s and young adult literature,

especially masterpieces of picture books that are shared herein. Paris is the home of Ludwig Bemelman's Madeline series and the setting of numerous Caldecott Medal and Caldecott Honor books.

Travel Guide Books and Maps

A number of publishers specialize in tour books of cities, regions, states (or provinces), and nations. Common publishers include National Geographic, Lonely Planet, Insight/Discovery, Fodor's, Frommer's, and DK Eyewitness Travel Handbooks. The library Dewey Decimal number for adult travel guide books about Paris is 914.436104.

A majority of middle-grade and secondary gifted students have more than likely never sampled the first-rate nonfiction writing found in these travel books. Once students have sampled this type of writing about Paris and France, they can hone their own technical writing authority by composing creative chapters (or entire books) about the people, places, and highlights of their own home city or state and myriad dream locations they choose to study.

Paschali, Pas & Robinson, Brian. *Walking Paris: The Best of the City*, 2nd ed. Washington, D.C., 2016.

Stunning color photography greatly enhances the lively text that highlights walking tours of nine unique Paris neighborhoods including trips to the Louvre, the Latin Quarter, Montmartre, and the Eiffel Tower. One special highlight is the chapter "Paris in a Weekend with Kids." The weekend begins with a climb up the steps of the Eiffel Tower, includes a side trip to the oldest toy store in Paris, a journey to see the Egyptian mummies at the Louvre Museum, and concludes with a visit to the world-famous Centre Pompidou. As with virtually all professional travel guides, *Walking Paris: The Best of the City* includes a treasury of helpful maps. The inside covers of this extremely

attractive guide feature fold-out maps of the entire city of Paris and the Paris Metro or subway system.

Gerrard, Mike & Dailey, Donna. *Top 10 Paris*. New York: DK Eyewitness Travel, 2016.

While *Walking Paris* is presented by the city's most memorable neighborhoods, the authors of *Top 10 Paris* organize their visually splendid "pocket guide" of Paris according to the top ten visits in a wide host of categories that highlight the wonders of Paris. Gerrard and Dailey begin broadly with "top ten" chapters on broad categories such as the "Top 10 Paris Highlights" and the "Top 10 of Everything." They do salute the "Top 10 Locations Not to Be Missed" which includes side trips to Versailles and Disneyland Paris. Other "Top 10" chapters are devoted to sporting events, places of worship, historic buildings, art galleries, fine dining, gardens, parks, shops and markets, plus book stores and book sellers. Two chapters not to be missed are the "Top 10 Children's Attractions" that includes a museum of magic with live performances, and the "Top 10 Merry-Go-Rounds" in the City of Light.

Two additional advantages of *Top 10 Paris* are the exceptionally brilliant color photographs of all Parisian attractions plus the fact that this useful pocket guide is updated every year.

For additional print guides to Paris, see *Rick Steves Paris 2016* (Avalon Travel, 2016) and *Frommer's Easy Guide to Paris 2016* (Frommer Media, 2016). Check libraries for DVD travel guides to Paris and France, especially those featuring Rick Steves as the on-camera travel guide. His video works are particularly "kid friendly."

Creativity Extensions

Direct students to use **Creative Productive Thinking (FFOE)** tools to

design a "wish list" travel guide of ten Parisian experiences for their dream trip to France's capital city. Virtual tours and other online sources can aid this process.

Encourage students to do their own searches on Paris, including a range of sources and media (not exclusively Internet based) focused on their interests. Explore maps, art books, literature, poetry, maps, popular songs, composers, and so forth. After students learn more about Paris, induce them to use **Brainstorming** to choose their favorite landmarks, art, food and other highlights and design original post cards to send back home to family and friends as they enjoy their once-in-a-lifetime trip to Paris.

Retro Children's Travel Guides

Sasek, Miroslav. *This is Paris*. New York: Universe Publishing, 2004.

_____. *This is the World: A Global Treasury*. New York: Universe Publishing, 2014.

Miroslav Sasek was born in Prague in 1916 and trained to become an architect reputedly when his parents refused him the freedom to pursue his first loves, drawing and painting. When the Communists gained power over Czechoslovakia in the aftermath of World War II, Sasek escaped from behind the "Iron Curtain" to Paris where he studied art at the world renowned *l'Ecole des Beaux Arts*.

Although Sasek was a fine artist and a prodigious writer and illustrator of diverse juvenile literature, he became especially well known for his **This is...** series, a comprehensive library of 18 unique travel guides. Each Universe reissue of Sasek's **This is...** series features Sasek's high-quality art and vibrant narratives that entice bright children around the world to become truly excited about the subjects of travel, geogra-

phy, history, and architecture. In 2014, Universe published *This is the World: A Global Treasury* that compiles highlights from the entire series.

Following a vacation to Paris in the late 1950s, Sasek created a manuscript and sketch book of the city geared especially for younger readers. He sought to introduce children to the history, architectural grandeur, and the vibrant population of the monumental City of Light in a manner far removed from adult travel guides. *This is Paris* (1959, 2004) opens with a visual overview of special highlights such as the River Seine and the unique landmarks of the Eiffel Tower, Notre-Dame, the Arc de Triomphe, and the gleaming white Sacre-Coeur basilica in Montmartre. The pose is spare, direct, and touched with a degree of sly humor that should delight children. Sasek pays homage to the great monuments, parks, and buildings of Paris, but he also gives an equal and delightfully sly nod to the city's feline population, street artists, nuns, flea markets, monkeys in the zoo, butchers, grocers, shoppers, a flower girl and a bicycle policeman, sidewalk book stall owners, and even a church warden who guards the mighty Notre-Dame. A particularly charming illustration captures the nostalgic appeal of the Rue de Chat (Street of Cats) that is a mere two yards wide.

Creativity Extensions

A thorough study of the M. Sasek's **This is...** series suggests a stimulating follow up activity for gifted, creative, and talented students. **Originality** and **Elaboration**, elements of **(Creative Productive Thinking)** may be employed as students choose favorite locations as their subjects to emulate Sasek's **This is...** series format. Gifted learners can research favorite places, engage in library explorations, make lists of people, places, and subjects they wish to highlight, engage in preliminary sketching, create storyboards, write

vibrant narrations, and ultimately produce their very own **This is...** volume.

The ABCs of Paris, France, and Matisse

Wilbur, Helen L. *E is for Eiffel Tower: A France Alphabet*. Illus. by Yan Nascimbene. **Discover the World** series. Ann Arbor, MI: Sleeping Bear Press, 2010.

E is for Eiffel Tower: A France Alphabet highlights the entire French nation, western Europe's largest country, but much of the content is devoted to the capital, Paris. This charming and colorful alphabet book features Sleeping Bear's famous two-tiered non-fiction content. Short poems in large print introduce topics for young readers while expository sidebars offer considerable detail about the subjects in finer print. Beautiful illustrations further highlight the chosen topics. One example is the letter P, "P is for Paris." The double-page spread open with pleasing verse.

P is for Paris

*We'll stroll the boulevards and then
we'll see the Louvre and cruise the Seine.
We'll stop for lunch in a small cafe.
A day in Paris is like no other day.*

The expository sidebars provide a verbal summary of the establishment of two small islands in the middle of the Seine River that ultimately became The City of Light and moves on to highlight adventurous days spent exploring present-day Paris. The illustrator's bird's-eye view of the heart of Paris on a snowy day is redolent of the artistic visions of great Parisian artists.

The letter H is for Victor Hugo one of France's greatest writers. He authored such classics as *Les Miserables*, *The Count of Monte Cristo*, and *The Three Musketeers*. Charles Perrault introduced "Cinderella," "Sleeping Beauty" and "Puss in Boots" and the genre of

fairy tales to world literature. During the darkest days of Nazi Occupation of Paris (1940-1944) and most of France during World War II, a French Resistance pilot wrote one of the most inspiring books in French history. Antoine de Saint-Exupery published *The Little Prince* in April of 1943. His masterpiece has become a staple of French language classes in American schools.

I is for Inventors. The metric system, the hot-air balloon, the "Aqua-Lung" (created by Jacques Cousteau), Braille, and food sterilizing (Louis Pasteur) are just a sampling of the creativity of French discoverers.

E is for Eiffel Tower ends with a page of 25 English-into-French words and phrases complete with phonetic spellings and pronunciations. Many gifted students will spend at least a semester or a full year of their high school or college careers engaged in study and travel in Europe. Most travel literature includes a glossary of English-into-French words and phrases to complement what they are learning in school.

Creativity Extensions

See also *Matisse from A to Z* (Peter Bedrick Books, 1995) by Marie Sellier. *Matisse from A to Z* provides one example of how alphabet books may be created by highly creative students from such disciplines as art, music, entertainment, movies, invention, science, and history.

Assign letters of the alphabet to individual students and direct them to **Brainstorm** Parisian topics for their letters. Employ **Combine** (from **SCAMPER**) to find a unique way to display their Paris ABC products.

Gifted students quickly learn how fragile creativity can be. A single word such as "book" may greatly limit their creative thinking. ABC books are effective catalysts, but they represent but

one use of the alphabet. As an alternative, students may be encouraged to employ **Originality** in their use of the alphabet to salute The City of Light. They may create three-dimensional objects, for example, to celebrate Paris in an alphabetical fashion.

Parisian and French Notables and Heroes Through the Ages

Inventors, scientists, artists, authors, composers, war heroes and notable Parisians from many fields are worthy of print and online reading and research. Some of the most celebrated citizens include:

Charlemagne, Saint Louis IX, Joan of Arc, Charles Perrault, Antoine Lavoisier, Blaise Pascal, Marquis de Lafayette, Napoleon Bonaparte, Victor Hugo, Louis Braille, Louis Pasteur, Marie Curie, Jules Verne, Auguste Rodin, Claude Monet, Maurice Ravel, Claude-Achille Debussy, Pierre de Coubertin, Charles De Gaulle, Coco Chanel, Colette, Leslie Caron, Catherine Deneuve, Simone de Beauvoir, Edith Piaf, George Sand, Juliette Binoche, and Jacques Cousteau. See many artists in **Degas**. Louis IX (1214-1270) is the only king of France to ever be canonized as a saint.

Matthews, Elizabeth. *Different Like Coco*. Cambridge, MA: Candlewick, 2007.

Gabrielle “Coco” Chanel is a typical Parisian heroine. Born poor and skinny, she became an orphan by age 12. Coco learned to sew at the orphanage and her love of fashion began as she sewed special clothes for her dolls. She learned the fashion trade working for a tailor, eventually acquiring a shop through an English benefactor. At first, women spurned Coco’s simple yet comfortable designs but she did not mind. She wanted to be different and soon her fashions began to set her apart as the most unique fashion designer in Paris and beyond. She succeeded in becoming one of the most influential persons

of the 20th century. Parisians – and later, people all over the globe – came to both honor and celebrate her unique qualities. Coco became a very wealthy woman. She created “the little black dress” and she expanded her business to the world of perfume. Chanel No. 5 debuted in 1921 and was the world’s most expensive perfume at the time. American movie mogul Samuel Goldwyn paid her one million dollars to design clothes for Katherine Hepburn, Grace Kelly, and Gloria Swanson.

Matthews salutes Coco’s difference by using her most famous quotations for her black-and-white end pages.

Fashion is architecture: it is a matter of proportions.

How many cares one loses when one decides not to be something but to be someone.

Creativity Extensions

Engage students in researching a famous Parisian such as Marie Curie or Jules Verne and then employ the reporters’ **Five W’s** to write a profile of the chosen subject for the classroom newspaper about Paris.

Have students pretend to be Coco Chanel or Yves Saint Laurent and design clothing or a special costume for a notable Parisian. The design and the model will appear on the front cover of a distinguished Paris magazine.

German Occupation and A Story of Great Heroism in Paris

Ruelle, Karen Gray, & DeSaix, Deborah Durland. *The Grand Mosque of Paris: A Story of How Muslims Rescued Jews During the Holocaust*. New York: Holiday House, 2010.

This exceptional historically-based picture book begins with a

quotation found in both Islamic and Jewish cultures:

Save one life, and it is as if you've saved all of humanity.

Despite revolutions and wars across many, many centuries, the nadir of Parisian history is generally believed to be the Nazi occupation of most of France and especially Paris from 1940 until 1944. *The Grand Mosque of Paris* relates the story of Muslim heroism dating from the First World War to the end of Nazi domination during World War II. Built in 1926 in the center of the city, the Grand Mosque was and remains a sprawling community center that includes not just rooms for prayers but also a library, a hall of records, a medical clinic, a steam bath, gardens, playgrounds, a restaurant, and even housing apartments. The mosque was built on land that was filled with underground passages, tunnels, and catacombs. During the occupation these areas served as hiding places for children and adults in grave danger.

From its opening the rector of the mosque was an Algerian-born diplomat, Si Benghabrit. He worked closely with Dr. Ahmed Somia, a Muslim from Tunisia. Many of the Muslims who lived in Paris during the Nazi occupation were Kabyles, Berbers from Algeria. The rector falsified papers noting the North African Muslim heritage of a great many Jews. Dr. Somia sent Jewish children to safety in health clinics that were extensions of the great mosque. The Kabyles spoke a language that was so little known by German soldiers that it could be used as an unbreakable code. Together, all of these Muslims risked their own lives by secreting, protecting, and transporting both French Resistance heroes and especially Jewish children to places that were safe havens such as the Free French regions of North Africa.

The illustrations of the book are reverent, somber, and in keeping with this remarkable chapter of history.

The paintings of the mosque itself are in keeping with Islamic art and architecture.

The daring rescues of Jews and French Resistance fighters involved some remarkable creative problem solving. One way that the Kabyles helped these people to escape was by hiding them inside empty wine kegs, placing the barrels on barges and transporting them via the River Seine until the potential victims were out of harm's way.

Creativity Extensions

Students may research a French or Parisian hero of the Second World War such as famed entertainer Josephine Baker (a spy for the French Resistance) or beloved author of *The Little Prince* Antoine de Saint-Exupery (aviator against the Nazis). Borrow any of the letters from **SCAMPER** to portray the honored hero(ine). Perhaps **Adapt** or **Adjust** the salient information from a standard report or biography to a poster or sculpture that honors the hero.

Inspire students to write an acrostic poem about a hero or heroine. Brainstorm words and phrases to complete a poem dedicated to brave Parisians during the Second World War.

H...
E...
R...
O...
E...
S...

Artists in Paris

Paris has been the untested capital of the world of art for at least the past two centuries. Such avant-garde schools of art invented by artists that lived and worked in Paris include Impressionism, Cubism, and Surrealism. Famed artists of painting, photography, and sculpture include Edouard Manet, Auguste Rodin, Henri Cartier-Bresson, Marc Chagall, Georges

Braque, Paul Gauguin, Henri Rousseau, Pierre-Auguste Renoir, Henri Marie de Toulouse-Lautrec and Rene Magritte.

Anholt, Laurence. *Degas and the Little Dancer*. **Anholt's Artist Books for Children series**. Hauppauge, NY: Barron's Educational Services, Inc., 2007.

Laurence Anholt is a British author and illustrator who has created a series of beautiful picture books that combine superb storytelling about great artists and their encounters with real-life children or young adults. The famous painters and sculptors were either born in Paris or lived there at one time in their creative lives. Anholt uses his considerable talent as a painter to illustrate these stories while also rendering beautiful reproductions of many of the artists' greatest creations.

In *Degas and the Little Dancer*, Anholt introduces Marie, a young girl living in Paris whose greatest dream is to become the world's greatest ballerina and to dance at the Paris Opera House. Marie is a gifted dancer, but her parents are too poor to pay for the lessons she needs to fulfill her quest. Just as her ambition is dashed, Edgar Degas (1834-1917) offers her a job to pose as a model for a masterpiece.

In the story, Degas is portrayed as an angry and demanding man. While losing his vision, he must switch from painting an oil portrait of Marie to a sculpture with clay. Still, at the conclusion of their work together, Degas confesses to his young model that his sculpture of her is the best thing he has ever done.

The full title of the statue is *The Little Dancer of Fourteen Years, 1880-1881*. In reality, Marie van Goethen did exist and posed for Degas' *The Little Dancer*. The sculpture was displayed in a glass case at the Impressionist Exhibition in Paris in 1881 and it became an immediate sensation. Upon the death

of Degas, twenty bronze copies of *The Little Dancer* were made and sold to the greatest museums in the world.

Additional volumes in **Anholt's Artist Books for Children series** include:

Camille and the Sunflowers: A Story about Vincent van Gogh.

The Magical Garden of Claude Monet.

Picasso and the Girl with a Ponytail.

Leonardo and Flying Boy: A Story about Leonardo da Vinci.

Cezanne and the Apple Boy.

Matisse: The King of Color.

Creativity Extensions

Adapt or Modify (from **SCAMPER**). Students write and illustrate a new addition to Laurence Anholt's series of stories about famous artists and children or young adults. For example, invite them to create a story about a classmate who meets Pierre-Auguste Renoir. What is the basis of their chance encounter? What is the resultant painting or sculpture?

Ask students to compare and contrast two or more of the picture books in the Anholt's Artist Books for Children series that feature artists working in or near Paris.

Engineering, Architecture, Sculpture

Paris is the home of some of the world's most amazing engineering feats, unique architecture, and at least one mighty sculpture. These monuments are hallmarks of creative genius and brilliant problem solving.

Engineering: The Eiffel Tower

The Eiffel Tower was constructed by Gustave Eiffel, a brilliant engineer, as the archway or entry point to the Paris World's Fair in 1889 which, in turn, was the 100th anniversary celebration of the French Revolution. At its original height (986 feet), the Eiffel Tower became the tallest structure in the world and remained so for 40 years until the opening of New York City's Chrysler Building (1,046) in 1930. Later, a radio transmission tower furthered the elevation of the Paris structure to 1,063 feet. Eiffel argued that the design was inspired by the Great Pyramid of Cheops, the only remaining Seven Wonders of the Ancient World. Today, the Eiffel Tower is the most visited monument in the world.

A Parisian Love Story

Briere-Haquet, Alice. *Madame Eiffel: The Love Story of the Eiffel Tower*. Illus. by Csil. Berlin, Germany: Little Gestalten, 2015. *New York Times* Best Illustrated Book of the Year.

Madame Eiffel (Cathy) is the loving wife of Gustave Eiffel. They live and love in the world's most romantic city. Cathy especially loves to travel, but an unknown illness leaves her deeply depressed and bed-ridden. An army of doctors do not know why she does not recover. But, Cathy has an idea. She tells her beloved husband what would make her happy. "You could build us a railway that takes us up to the clouds in a blink." With a flash of inspiration, Gustave knows what he must do. He must build the vertical railway Cathy imagines. He completes the mighty tower and Cathy's health returns.

The brief love story is imaginative and a fine read-aloud picture book, but the highlight are the pen-and-ink drawings by Csil. They capture Paris as it must have appeared when the magnificent monument was built by a man very much in love with and inspired by his loving wife.

A Verse Tribute

Lewis, J. Patrick. *Monumental Verses*. Washington, D. C.: National Geographic Society, 2005.

Poet Patrick J. Lewis begs readers to examine 16 of the world's most well-known monuments that represent human ingenuity and creativity at its finest. He takes his title, *Monumental Verses* from a line by poet Dante Gabriel Rossetti who once wrote that a poem is a "monument's monument." He uses a variety of verse forms from acrostic to concrete to free verse to pay homage to magnificent structure such as the Eiffel Tower. His tribute begins:

*Three hundred workers nailed you,
The Prince of Wales unveiled you,
Your countrymen have hailed you a star.*

Other Parisian and near-Parisian monuments poetically celebrated by Lewis are the Arc de Triomphe and the Palace of Versailles.

Architecture: Notre-Dame Cathedral

On 15 April 2019, a tragedy occurred in Paris. A structure fire broke out beneath the ancient roof of Notre-Dame Cathedral causing extensive damage and great sorrow for the French people. Notre-Dame ("Our Lady") was the first great French Gothic cathedral. Construction began in 1163. The cathedral was completed and the dedication mass was held in 1345. Notre-Dame was one of the first great buildings of the Middle Ages to use flying buttresses that allowed for thinner and higher walls and great stained-glass windows that illustrated scenes from the Bible. In front of the Notre-Dame Facade stands the grand equestrian statue of Charlemagne (742-814 A.D.) whose reign marked the birth of France as a nation.

Two authors feature Notre-Dame in exceptional children's books.

Dillon, Patrick. *The Story of Buildings: From the Pyramids to the Sydney Opera House and Beyond*. Illus. by Stephen Biesty. Sommerville, MA: Candlewick Press, 2014.

Patrick Dillon tells the story of how the massive cathedral was constructed and Stephen Biesty complements the narration with dramatic and colorful cut-away drawings of the many unique features of the new style of architecture, French Gothic.

Macaulay, David. *Building the Book Cathedral*. Boston, MA: Houghton Mifflin Company, 1999.

_____. *Cathedral: The Story of Its Construction*. Boston, MA: Houghton Mifflin, 1981.

David Macaulay's Cathedral of Chutreaux is a fictional site but his exceptional pen-and-ink drawings and expert storytelling reveal how the great French Gothic cathedrals were built by the people of 12th, 13th, and 14th-century Europe. Twenty-five years after the publication of his first book, *Cathedral: The Story of Its Construction*, a Caldecott Honor book, Macaulay went back to France and added a great deal of further architectural substance to his original volume in *Building the Book Cathedral*.

Sculpture: The Statue of Liberty

Beginning in Paris in 1865, a great idea was born. The people of France would honor the one hundredth anniversary of American Independence by giving to the United States a great sculpture to be named "Liberty Enlightening the World." The influential Parisian sculptor Frederic-Auguste Bartholdi was chosen to create the figure of a great lady holding high the lamp of liberty in the artistic style of neoclassicism. She would wear a crown of seven spires, like the rays of the sun, that would repre-

sent the seven continents and the seven seas. Constructed by engineer Gustave Eiffel, the colossal statue would be made of iron and copper and stand at a height of 150 feet. The French would give the mammoth statue to the United States of America and the Lady Liberty would face eastward as a symbol of America welcoming immigrants from the old world to the world's greatest democracy. A Russian immigrant Emma Lazarus referred to the great lady as the "Mother of Exiles." She composed the sonnet, "The New Colossus" which was engraved on the giant pedestal and included these famous words:

*Give me your tired, your poor, your
huddled masses yearning to breathe free...*

"Liberty Enlightening the World" was built in Paris and shipped to the United States in 1884. It was reassembled and formally dedicated on October 28, 1886. A superb picture book history of the Statue of Liberty is Lynn Curlee's *Liberty* (New York: Atheneum Books for Young Readers, 2003). The Statue of Liberty is another creation that J. Patrick Lewis celebrates in *Monumental Verses*. See also *Emma's Poem: The Voice of the Statue of Liberty* (Houghton Mifflin, 2010) written by Linda Glaser and illustrated by Claire A. Nivola.

Creativity Extensions

After exploring engineering, architecture, and sculpture through these examples, students can write new stories with a variety of dazzling structures as settings. Encourage imagination that might involve Parisian icons. Perhaps Madeline is spending a day exploring the tower. Might a visiting American student meet her and enjoy an exciting adventure? Students will be **Combining** ideas (from **SCAMPER**) and using both **Originality** and **Elaboration** from Creative Productive Thinking.

Invite students to read J. Patrick Lewis's poetic tribute to the Eiffel Tower in *Monumental Verses*. Next, they

employ **Flexibility** from **Creative Productive Thinking**. Encourage students to also celebrate this great Parisian landmark but with a different verse form such as an acrostic poem.

Direct students to research online resources about the history and special features of the soaring edifice of Notre-Dame (or some other structure). Students can use *The Five Ws* of journalism plus **Originality (Creative Productive Thinking)** to write a story of how a young person who lived in 13th-century Paris viewed the building of the cathedral. How might a child have helped cathedral builders of that time period?

Using art media of their choice encourage students to engage in **Brainstorming** to enable them to design a glorious new window for Notre-Dame.

Direct students to borrow **Reverse** (from **SCAMPER**). France gave the Statue of Liberty as a very special gift to America. How might the USA reciprocate? That is, how could the United States build a special gift for the people of France? One example. If not for the aid given by the French to the thirteen colonies during the battles of the American Revolution, victory and the creation of a great new democracy might not have occurred. Students can draw plans and even build a scale model of a great monument that contemporary Americans could give to the people of Paris and France. This activity is a fine opportunity for students to use the six stages of **Creative Problem Solving**.

Students can also borrow a page from J. Patrick Lewis's *Monumental Verses*. They can write a poem that will be inscribed on the monument Americans ultimately decides to donate to France for display in Paris.

Madeline: The Most Courageous Little Girl in Paris

Bemelmans, Ludwig. *Madeline*. New York: The Viking Press, 1939. Caldecott Honors.

_____. *Madeline's Rescue*. New York: The Viking Press, 1953. Caldecott Medal.

Few children's books begin and end in verses that are instantly recognizable to generations of children who first met Paris through the eyes of a fearsome and petite heroine, Madeline, who is so brave a child that she says to a fearsome tiger in the Paris zoo, "Pooh-pooh." The original *Madeline* begins,

*In an old house in Paris,
That was covered with vines
Lived twelve little girls
In two straight lines*

and ends, forever, with these words,

*...and that's all there is – there
isn't any more.*

Madeline is a spirited little red-headed Parisian girl who is the smallest of twelve young girls in a Catholic boarding school in the heart of Paris (circa 1939) which is headed by the redoubtable Miss Clavel. Miss Clavel takes Madeline and her eleven companions on daily outings that allow them to see the Eiffel Tower, the Paris Opera House, The Place Vendome, the Hotel des Invalides, the Church of the Sacre Coeur, the Tuileries Gardens and the Louvre Museum.

From 1939 to 1961, Ludwig Bemelmans created six Madeline books that additionally included *Madeline and the Bad Hat*, *Madeline and the Gypsies*, *Madeline in London*, and *Madeline's Christmas*. He certainly could not have imagined the world-wide fame and the incredible staying power of his impish creation. Madeline has been merchan-

dized as dolls and other toys, multiple films and television programs, songs, a biography of Bemelmans plus sequels crafted by his own grandson and biographer, John Bemelmans Marciano.

Marciano's extended Madeline adventures to include *Madeline at the White House* (Viking, 2011) *Madeline and the Cats of Rome* (Penguin, 2008), *Madeline in America and Other Holiday Tales* (Scholastic, Inc., 1999), and *Madeline and the Old House in Paris* (Viking, 2013). He is also the author and compiler of an attractively illustrated biography of his grandfather, *Bemelmans: The Life and Art of Madeline's Creator* (Viking Press, 1999).

Creativity Extensions

In *Madeline's Rescue*, a brave dog named "Genevieve" saves Madeline from an almost certain drowning in the River Seine. The author, Ludwig Bemelmans, recounts the dramatic tale in the 1954 Caldecott-winning picture book. Students can **Substitute (SCAMPER)** a new and unique narrator of the story. Rewrite (and illustrate) Madeline's daring escape from harm by "Genevieve" as the first-person (canine) author.

Invite students to imagine that Madeline, her classmates, and Miss Clavel travel on a spring break to their home town (Chicago, Denver). What adventures await the brave young charges who reside the rest of the year in the heart of Paris?

A Lion, A Giraffe, and an Elephant Visit Paris

Three great African animals come to Paris in a famed series and in two new children's books that are destined to become classics. Their perspectives and situations are indeed wonderful introductions to the Paris of both the 1930s and today.

Alemagna, Beatrice. *A Lion in Paris*. New York: Abrams, 2015.

In this glorious extra large format picture book a young and curious but lonely lion leaves his native grasslands to seek a brighter and happier future elsewhere. He arrives in Paris by train at the Gare de Lyon station. His many adventures include stopping at a café for a cup of morning coffee, spotting his reflection in the River Seine, encountering a smiling young woman (*Mona Lisa*) in the Louvre, strolling through the wondrous Montmartre, and finding a giant tower (Eiffel) that he loves. At a major intersection of Paris streets, he finds a large empty stone that seems to be made just for him. Finally, he has found his true home and perfect contentment. People in cars toot their horns to welcome him.

The story was inspired by the statue of a lion in the Place Denfert-Rocher that was first erected in Paris by architect Frederic Auguste Bartholdi between 1876 and 1880. The illustrations and the design of the book are superb. The inside front cover is the young lion's map that points out the famous landmarks of Paris that he sees. The giant-size pages and text are horizontally-oriented and the books is intended to be encountered as if reading a calendar. Alemagna captures the lion's wonder at he encounters both the people and unique places of the great city. His facial expressions are priceless. A lion enjoying a morning cup of coffee in a typical sidewalk cafe appears to be as natural as the flowing of the city's great river. In Paris, not even a visiting lion is out of place.

Holmes, Mary Tavener & Harris, John. *A Giraffe Goes to Paris*. Illus. by Jon Cannell. Tarrytown, NY: Marshall Cavendish, 2010.

In 1827, Muhammad Ali, Pasha of Egypt presented Charles X, the King of France with a very special

gift, a young giraffe born near Felucca in the south of Egypt. Her devoted Sudanese caretaker and the narrator of this remarkably true story is Atir. Belle and Atir's travels began with a trip on the mighty Nile River to Alexandria and across the Mediterranean to the French port city of Marseille. As Belle made her way down the ship's gangplank on its arrival in Marseille, spectators were incredulous. Belle was 12 feet tall and unlike any living creature they had ever seen. Tired of the sea travel, Belle was most comfortable strolling the streets of the city. Belle and Atir would walk the 500 miles to Paris which would take 41 days. Special boots protected her feet and a royal blanket kept her warm.

Parisians were caught up in a frenzy of anticipation awaiting Belle's arrival. There were giraffe songs, paintings, pottery, wallpaper, jewelry, toys, and even Belle-inspired hair styles. The grand culmination of Belle's very long journey occurred on July 9, 1827 when the king received Belle. Atir and Belle were given special living quarters in the *Jardin des Plantes*. In their first six months in Paris, six hundred thousand Parisians came to see Belle.

Jon Cannell's illustrations, including maps, visually capture the excitement people of both Egypt and France experienced when Belle traveled the Nile and walked to Paris, her new home.

de Brunhoff, Jean. *The Story of Babar*. New York: Random House, 1931.

Inspired by a story told by his wife Cecile to their sons, Jean de Brunhoff (1931) created magnificent pictures of the abandoned baby elephant and his travels to Paris, including his encounter with a kind Old Lady who clothes him and introduces him to the ways of French culture. He gave the young pachyderm a name, "Babar." For a time, the father used watercolors to create what many critics believe to be the

first true picture book in the history of children's literature, *The Story of Babar* (Random House, 1931). Jean de Brunhoff created five more "Babar" picture books before his own untimely death from tuberculosis in 1937. In Babar's adventures, the once desperate young elephant returns to the jungle, marries his cousin Celeste, becomes king of the elephants, and lovingly raises his own children – Pom, Flora, and Alexander—in their own city of Celesteville.

Laurent de Brunhoff was just 12 when his father died, but he was already on course to follow in his father's footsteps as an artist. Drawing elephants and telling stories about them brought him great joy and he has been re-creating and inventing new stories of Babar since 1946. Two newer Babar books are especially appropriate for gifted children to help them learn more about French scenery and culture through the present-day activities of Babar, Celeste, and their children. Both books are beautifully illustrated and both also feature exquisite fold-out posters, elephantine-sized, on heavy stock paper highlighting the subjects of each book, fine art and world travel.

Laurent de *Babar's Museum of Art* (New York: Harry N. Abrams, 2003) is clearly a tribute to the exceptionally creative French enterprise, in the 1970s and 1980s, of transforming the abandoned Victorian train station, *Gare d'Orsay* into the magnificent *Musee d'Orsay* that houses the great Impressionist paintings once kept in the Louvre. The conversion of Celesteville's former train station allows Laurent de Brunhoff to re-introduce the characters his mother and father created in the 1930s and paint at least 30 marvelous reproductions of the world's great art treasures with anthropomorphized pachyderm subjects. The elephant models are creatively used to recreate master-

pieces by a variety of artistic giants.

The latest Babar adventure by Laurent de Brunhoff begins when the loving father who is also king of the elephants announces to his children, "Your mother and I have a surprise for you. We are taking you around the world." Those words open up a world of discovery for readers of *Babar's World Tour* (New York: Harry N. Abrams, 2005). The pachyderm family have many adventures that include language learning in Italy and Russia, flamenco lessons in Spain, snorkeling in Thailand, the pyramids in Mexico, and the temple of Abu Simbel in Egypt. Most appropriately, in Paris, they marvel at the beauty and grandeur of the Cathedral of Notre Dame and attend a Paris fashion show. Of course, like most families who take a grand tour, Babar's family can hardly wait to see all the magnificent photographs and images they have captured on film of their global trek.

Creativity Extensions

Raise the bar on creativity. Ask students to use **Modify (SCAMPER)** the adventures of the lion in the *Place Denfert-Rochereau*, the giraffe "Belle" and/or "Babar," the elephant from picture books to a daily comic strip in one of the premier newspapers of Paris.

Parisian leaders **Put to other uses (SCAMPER)** an old and unused train station in The City of Light when they converted it to a world-class museum of modern art, the d'Orsay Museum. Encourage students to use **Brainstorming** as they seek new ways to make use of another public building such as an empty school or university building, an old hospital, or another edifice that is scheduled to be demolished in the near future. Encourage students to draw images and blueprints of their imagined renovations.

Exquisite Picture Books of Children in Parisian Settings

Countless picture books capture the glory of Paris as a background for highly imaginative stories for children and young adults. The following titles represent but a small number of such magnificent books that may be appreciated by children of all ages. Although most of the titles are fictional, many connect with the real lives of famous artists, composers, fashion designers, and other notable Parisians. Library and Internet searches will help gifted students find many additional picture book wonders.

Picture books are typically related to reading for elementary students. However, many of the picture books listed here should be available to middle and high school gifted students. Two examples. The Author's Notes of *Claude Monet: The Painter Who Stopped the Trains* provides a fine introduction to Impressionism and art criticism. The Artist's Notes at the end of *Adele & Simon* provide historical contexts for both the scenery and notable Parisians portrayed circa 1900. End notes best serve secondary students to introduce the history and culture of the City of Light more than a century ago.

Anderson, M. T. *Strange Mr. Satie*. Illus. by Petra Mathers. New York: Viking, 2003. A colorful and highly inventive view of the eclectic Parisian composer Erik Satie.

Druvert, Helene. *Paris Up, Up and Away*. New York: Thames & Hudson, 2016. In this highly imaginative picture book the Eiffel Tower becomes bored and lifted by a flotilla of balloons spends a day soaring over the entire city of Paris. Here is the perfect aerial view of the great structure's home city.

Johnson, D. B. *Magritte's Marvelous Hat*. New York: Houghton Mifflin, 2012. Rene Magritte was born in Belgium but moved to Paris and joined other experimental artists who founded the field of modern art known as Surrealism. The unique placement of transparency pages in the book better reveal the essence of this unique art form than any possible definition could.

Maltbie, P. I. *Claude Monet: The Painter Who Stopped the Trains*. Illus. by Jos. S. Smith. New York: Harry N. Abrams, 2010. Glorious artwork and a lively narrative examine the lives of Claude Monet, his young son, and the school of painting that became known as Impressionism.

McClintock, Barbara. *Adele & Simon*. New York: Farrar, Straus and Giroux, 2006. The setting is Paris in the early 20th century and what happens when a sister and younger brother go on a colorful walk through the beautiful streets of Paris. It is a charming story that ends with the friendly people of Paris who stand in line waiting to return the personal items Simon had lost on his walk. The author's end notes, filled with history, are definitely for mature readers. To add authenticity to the period flavor of the book, the end pages are reproductions of a map of Paris from Karl Baedeker's 1907 edition of *Paris and Environs*. Fans of this delightful brother and sister act will want to read the sequel, *Adele & Simon in America* (Farrar, Straus and Giroux, 2008).

McCully, Emily Arnold. *Mirette on the High Wire*. New York: G. P. Putnam's Sons, 1992. Caldecott Medal. In a gas light era of Paris a courageous young girl gives back a famed circus performer the courage that he had lost. Every painting appears to be an Impressionist painting of museum quality. The artist's color palette is extraordinary as are her lovely watercolor paintings. The scenes, mostly above Paris roof tops, adds an entirely new visual perspective of Paris for readers.

Priceman, Marjorie. *Hot Air: The (Mostly) True Story of the First Hot-Air Balloon Ride*. New York: Atheneum, 2005. Caldecott Honor. Priceman's radiant pictures recount the first-ever hot-air balloon ascension that took place at the Palace of Versailles (11 miles from the center of Paris) by its French inventors Joseph Montgolfier and his brother Etienne on September 19, 1783. The flight lasted eight minutes and traveled two miles. The spectators included King Louis XVI, Queen Marie Antoinette, and America's Ambassador to France, Benjamin Franklin.

Rubbino, Salvatore. *A Walk in Paris*. Somerville, MA: Candlewick Press, 2014. A young girl and her loving grandfather spend a full day on a walking tour of Paris. They visit all the special places that make Paris such a mecca for tourists from all over the world. They begin early in the day and finish with a nighttime view of the Eiffel Tower aglow with gold lighting. The page dedicated to the Eiffel Tower unfolds (vertically) to twice the size of the rest of the book pages. The end pages are contemporary maps of Paris with a dozen landmarks highlighted.

Selznick, Brian. *The Invention of Hugo Cabret*. New York: Scholastic Press, 2007. Caldecott Medal. Primarily the story of an orphan boy genius, but also an introduction to the birth of cinema in Paris and its first great movies.

Williams, Marcia. *Les Miserables: The Epic Masterpiece by Victor Hugo*. Williams retells one of the great masterpieces of French literature in a comic book fashion. She makes the story accessible to young readers.

Yolleck, Joan. *Paris in the Spring with Picasso*. Illus. by Marjorie Priceman. New York: Random House, 2010. This sumptuous picture book introduces readers to the great city and its splendid scenery. In addition to Picasso,

readers meet Gertrude Stein and other members of the art and literature communities of Paris. Priceman's illustrations are extremely vivid and fluid.

Creativity Extensions

Students read *A Walk in Paris* by Salvatore Rubbino and Barbara McClintock's *Adele & Simon*. Both feature walking tours of Paris but the time settings are a century apart. Imagine Adele of (*Adele & Simon*) on a walking tour of Paris today (as featured in *A Walk in Paris*) with her grandfather rather than her younger brother Simon. Fast forward the journey by at least one hundred years. Encourage the use of the four components of **Creative Productive Thinking (FFOE)** to create at least three picture book pages of the walking journey highlighting special scenes the two characters observe.

Marcia Williams **Adapted (SCAMPER)** *Les Miserables* for a young audience. Encourage students to read a classic book with Paris or France as its setting. Young readers may examine a French version of "Cinderella" (*Cendrillon*) by Charles Perrault and mature readers may read *A Tale of Two Cities* by Charles Dickens. Encourage readers to then adapt these classics for younger audiences, especially by using comic book or graphic novel images.

Many classics have become stunning films. *Hugo* (Warner Brothers, 2012) is a notable example as is *The Hunchback of Notre Dame* (Walt Disney Studios, 2002). *Madeline* (Sony Pictures Home Entertainment, 1998) reveals the sheer beauty of Paris for young viewers. Explore film versions of great stories as they can take the imagination of young people to another level.

La Fin

Students on a multidisciplinary “trip” to Paris, as outlined here, enable them to absorb a great deal of territory, while pursuing their interests and creative ideas. Now that they have been enthralled with their educational and creative trip to Paris, where will they travel next? Teachers and students will use **Creative Problem Solving** to replicate all their experiences in Paris on future journeys to Australia, Venice, Hong Kong, or Washington, D.C.

Au revoir!

Jerry Flack is Professor Emeritus of Education and President’s Teaching Scholar at the University of Colorado. He is a reviewer of children’s literature of various publications, author of 10 books as well as numerous articles on creativity and curriculum development. He is the 2003 recipient of the E. Paul Torrance Award from the National Association for Gifted Children.



Brandon Yao

Book Review: (2017) Jacob's Ladder:

Reading Comprehension Program
K-1, 1-2, 3, 4, 4-5, 5, 6-7, 6-8, 7-8
Joyce VanTassel-Baska, Ed.D.
Tamra Stambaugh, Ph.D.
Prufrock Press Inc.
paperback, \$39.95, approx. 161 pp.
ISBN-13: 978-1-61821-724-D

Reviewed by Elaine S. Wiener

Finding all these books in one series is like seeing your favorite ice creams and wanting to eat them all at once!!

These books run through grades K-8 with the authors reversing their name credits and also sharing credit on some books with the Center for Gifted Education. Each book is eight and a half by eleven inches so that the pages are big enough to reproduce.

"Jacob's Ladder is a supplemental reading program that implements targeted readings from picture books, fables, and poetry that link reading comprehension and analysis with content disciplines. With this program, students engage in an inquiry process that moves from lower order to higher order thinking skills. Starting with basic literary understanding, students learn to critically analyze texts by determining implications and consequences, generalizations, main ideas, and/or creative synthesis."

By the time you get to grades 7-8, the Table of Contents reads like this but all grades are similar:

Part I: Teachers' Guide to Jacob's Ladder Reading Comprehension Program

Part II: Readings and Student Ladder Sets

Chapter 1: Short Stories

Chapter 2: Poetry

Chapter 3: Biographies

Appendix A: Pre and Post Assessments

Appendix B: Record-Keeping Forms/Documents

Appendix C: Alignment to Standards

Common Core State Standards Alignment

A little example to whet your appetite:

The Red Book

by Barbara Lehman

Caldecott Honor Book

This book about a book exposes both the main character and readers to new parts of the world. The main character, a young schoolgirl, finds a magical red book that has the ability to connect people from remote distances, allowing her to develop a friendship with a boy who is far away.

Jacob's Ladder books are large and expensive, but a program can buy a set which then can be checked out and used. The name, Jacob's Ladder, brings back wonderful memories.

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Currently retired from teaching gifted children in Garden Grove Unified School District, **Elaine S. Wiener** also served on the Board of Directors of the California Association for the Gifted (CAG) and as Associate Editor for the *Gifted Education Communicator*. She has contributed numerous articles for this widely respected publication and continues to write book reviews, sidebars, and her column. She received CAG's Award of Recognition in 2004. 17elaine@att.net.

Torrance Journal for Applied Creativity



Torrance Center for Creativity and Talent Development

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