Editorial:

Spotlight on Edward de Bono Thinking Skills and Twice-Exceptional Gifted Learners Applied to Mars Mysteries in NASA Photographs

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Abstract

This editorial provides background information concerning the lessons presented in the eight practical articles of this issue. All of these lessons address Mars Mysteries, anomalous features found in NASA photographs of the Martian surface. These unusual and thought-provoking features are explored by using Edward de Bono CoRT thinking skills to broaden perceptions enhancing critical and creative thinking. The lessons are intended to explore possibilities, but not to provide a definite final answer as to what the anomalies represent. These lessons were designed as enrichment lessons for gifted learners and support Renzulli's Type I general exploratory experiences that expose students to a variety of issues not usually addressed by the school curriculum. These lessons also fit with Type II skill lessons because they focus on the de Bono thinking skills. Additionally, individual lessons are each designed to meet the needs of twice-exceptional gifted learners, containing lesson design features that assist gifted learners with specific disabilities or exceptionalities. Finally, each lesson includes a brief integrated arts project to synthesize the concepts discussed, expressing individual conclusions. Arts were integrated to foster engagement, increased level of attention, joy, and self-expression.

Key Words

Mars mysteries, twice exceptional gifted students, Edward de Bono CoRT Thinking Skills, arts integration

Introduction

Students need skills for critical and creative thinking to make sense of the complex world around them and to excel in our increasingly complex society. Most 21st Century Skill sets contain critical and creative thinking skills (Dede, 2010; e.g., American Association of College and Universities, 2007; Cisco, Intel, Microsoft, & University of Melbourne, 2009-2012; Partnership for 21st Century Skills, 2006). The current world demands students acquire a different set of skills and competencies than emphasized during the last century, to function effectively at work, as citizens, and in their leisure time (Ananiadou & Claro, 2009).

Technology now makes possible many previously inaccessible authentic learning experiences (Campbell & Oblinger, 2007; Lombardi, 2007) such as using thinking skills to investigate online photographs of Mars surface features

from the National Aeronautics and Space Administration (NASA), the Jet Propulsion Laboratory (JPL), and Google Mars. The current issue of the *Journal of STEM Arts, Crafts, and Constructions* presents several practical articles (Al-Hassan, Adebiyi, Iqtadar, & Atwood-Blaine, 2018; Cox, Sova-Tower, & Wear, 2018; DeVore, Rafanello, &Rafanello, 2018; Pepanyan, Fisher, & Wallican-Green, 2018; Meyer, Griffin, & Butler, 2018; McCoy-Parker, Benda, & Ebede, 2018; Rau & Becker, 2018; Zabel, Castello, & Makaula, 2018;) that use Edward de Bono's critical and creative thinking skills (de Bono, 1985) to explore anomalies in NASA photographs of the surface of Mars. Each article explores a different type of Mars Mystery, an anomalous image found on the Martian surface such as a large face, pyramid or structure, body of water, human or humanoid figure, animal or animal statue, animal skeleton, glass tube or tunnel, or large landscape pictogram visible from above. Each practical article lesson uses three of de Bono's thinking skills, concluding in a simple art project to express the culminating ideas. These practical lessons are designed to challenge twice exceptional students – gifted students who also have an exceptionality or disability – to explore these mysteries in a structured manner. Each lesson was designed to accommodate gifted students with two areas of exceptionalities. Although all of these practical lessons were implemented with a group of adult graduate students, they may be mined for ideas and adapted by k-12 teachers for their students, especially those who are twice exceptional.

A comparison of 20th century to 21st century curricula (Dede, 2010) identified two types of skills, perennial skills valued throughout history and contextual skills unique to new millennium work and citizenship. Several of these skill sets are mentioned here to make connections to the Mars Mysteries project. In the current century, learners need to learn academic content, but additionally need to know how to keep learning and how to make effective and innovative use of this knowledge throughout their lives, a contextual skill in our rapidly changing world (Partnership for 21st Century Skills, 2006). These Mars Mysteries projects support this idea by teaching students skills for analyzing and thinking about these anomalous images. Visual literacy and information skills are a contextual core part of the EnGauge Framework (Metiri Group & NCREL, 2003). Discussing these visual anomalies present in NASA photos allows students to consider their possible sources, meanings, and implications. The Essential Learning Outcomes (American Association of College and Universities, 2007) stresses engagement with big questions, both contemporary and enduring. What larger, persistent questions are there than "Are we alone in the universe?" and "Is there life on other planets?" Skills for integration of technology into the curriculum (International Society for Technology in Education, 2007) emphasize creating original works as a means of personal or group expression. Culminating artwork created or shared through technology, a potential part of these lessons, supports this criterion.

Meeting the Needs of Gifted Learners

Some students demonstrate outstanding performance or the potential for such performance in academic, creative, leadership, or artistic domains when compared to peers. Appropriate education for these gifted learners maximizes opportunities for student self-fulfillment and increases the pool of creative problem solvers and producers of new knowledge for all of society (Renzulli, 2012). The range of learning potentials justifies differentiated opportunities and services.

A more-inclusive schoolwide model of gifted education was developed to promote flexible approaches in identification and programming for gifted, high achieving, highly-motivated and creative students (Olenchak & Renzulli, 1989). This trend was based upon the realization that human abilities are not fixed and that many activities recommended for gifted individuals can be applied to a broader segment of the school population. Greater emphasis on performance-based education and the desire to integrate special and regular programs also contributed to this movement (Olenchak & Renzulli, 1989).

Three types of enrichment lessons were developed for the Schoolwide Enrichment Model and are called the Enrichment Triad Model (Renzulli, 2012; Renzulli & Reis, 2000). Type I enrichment lessons provide general exploratory experiences that expose students to a variety of fields of study, topic, issues, occupations, hobbies, and events that are not typically addressed by the school curriculum. The Mars Mysteries lessons fit into this category because they bring

highly interesting features on the surface of Mars to light, a subject not generally part of the curriculum. Additionally, the popular activity of searching through recently-released Mars photographs for anomalies, then, creating videos and websites to advertise these findings is a fairly recent hobby for many people. Type II enrichment lessons are group training activities in which students learn thinking skills or explore their feelings about a topic. The Mars Mysteries lessons address this area by incorporating three CoRT thinking skill exercises (de Bono, 1985) in each lesson: two Breadth thinking skills and then a third thinking skill from the Organization set or the Information and Feeling set. Finally, Type III enrichment activities are individual or small group projects that investigate real-world problems personally attractive to students. Such problems have no existing resolution and are designed to have an impact on a real-world audience. For example, searching through NASA photographs for anomalies, making a video about the discovered anomalies, and posting it to the Internet is a Type II Activity. The lessons described in the practical lessons in this issue are not Type III activities, but could inspire students to design Type III activities related to Mars Mysteries. Such self-motivated projects represent the culmination of natural learning, evidencing synthesis of ideas and an application of content, process, and personal involvement (Renzulli, 2012).

Gifted learners who also have disabilities or exceptionalities are addressed by this set of published practical lessons. Although these learners need accommodations, modifications, or remediations for their exceptionalities, they also require opportunities to develop their individual strengths and talents in the domains in which they have displayed superior abilities (Beckley, 1998). Twice exceptional gifted learners may be students who have been identified as gifted, but who evidence difficulties in school; students who have been identified as having a learning disability but whose exceptional abilities in other areas have not been recognized or addressed; or students in general education who have been unrecognized for gifted education because they were viewed as unqualified (Beckley, 1998). Twice exceptional gifted learners often experience frustration and tension because their areas of disability may prevent them from experiencing the ease of learning that other gifted students experience. Therefore, teachers need to individualize lessons to accommodate student needs. The lessons in these practical lessons were each designed for two different exceptionalities to highlight the possible ways teachers might design the learning environment for twice exceptional students.

Edward de Bono and CoRT Thinking Skills

Edward de Bono, born in 1933 in Malta, is a renowned physician, psychologist, inventor, and author who is widely viewed as the foremost leader in the direct teaching of thinking as a skill (Editors, TheFamousPeople.com., 2014). Edward de Bono is a gifted individual who enjoyed life-long learning and university study. He earned a medical degree from the University of Malta. Subsequently, he earned a Ph.D. degree and a DPhil from Trinity College, Cambridge. He continued his education, graduating with a DDes from the Royal Melbourne Institute and an LLD the University of Dundee. He worked as a lecturer at Oxford and moved on to teaching at the University of London before becoming assistant director of research at Cambridge University. He then began publishing books.

Edward de Bono's first book focused on lateral thinking. Edward de Bono originated the term *lateral thinking*, the process of generating new ideas through breaking the concept patterns of old ideas and stimulating new ones (de Bono, 1970). After several intervening books, he published *Six thinking hats* (de Bono, 1985, 1999), in which hats of different colors are used to symbolize different thinking perspectives. The white hat is concerned with facts; the red hat calls attention to emotions; the black hat is careful and cautious; the yellow hat represents a sunny and positive view; the green hat brings fertile growth; creativity and new ideas; and the blue hat is the hat of organization. This popular book was used by numerous businesses to guide decision-making.

Edward de Bono developed the Cognitive Research Trust (CoRT) Thinking Program (de Bono, 1985) to guide the direct teaching of thinking skills. This program guides the learner to broaden perceptions of a problem so that the pool of possible solutions includes as many ideas as possible before selecting a response. De Bono's thinking skills allow thinkers to see things more clearly, more broadly, and differently. The CoRT system contains six sets of ten thinking skills each. The CoRT Breadth skills, the initial set, form a strong foundation for thinking and have been incorporated into these lessons described in this editorial and featured in all of the practical articles in this issue. Skills from two other sets have also been applied to the Mars Mystery lessons on which

this editorial focuses. Therefore, a total of eighteen thinking skills, shown in Table 1, have been applied to the lessons highlighted in these practical articles.

Several studies have documented the utility of the CoRT Thinking Skills system as effective organizers for discussions. A study in which third graders used a problem-based learning approach to study bird adaptations for habitat guided by the CoRT Breadth Skills (Rule & Barrera, 2006) found pretest/posttest assessments of science content, interest, and descriptive vocabulary showed significant student gains. Another study with fifth graders who were exploring what students can do for the environment (Gray, Elser, Klein, & Rule, 2016) successfully used the CORT Breadth thinking skills to guide discussions and subsequent writings about environmental issues. Students' writings showed steady growth in number of words, sentences, suggested environmental actions for youth, and instances of discussing consequences and sequels of actions. The CoRT skills involved students in collaborative and engaging discussions, effectively structuring the lessons in the unit. In another example, the de Bono Breadth thinking skills were used to structure discussions of graphic novels, heavily illustrated texts, and typical novels in a literacy study with fifth graders (Jennings, Rule, & Vander Zanden, 2014). Students led the discussions by choosing one of the ten de Bono skills and generating a question using the skill that was applied to the story. Other students contributed ideas. When ideas for this question had been exhausted, the teacher asked another student to volunteer to suggest a new de Bono skill and use it to discuss the story. In this study, graphic novels received the highest scores in comprehension, enjoyment, and numbers of student discussion responses. Another study (Rule & Stefanich, 2012), used the CoRT skills to structure discussions at a professional working conference on students with disabilities pursuing careers in STEM fields. The CoRT Breadth thinking skills provided a robust structure for guiding meaningful discussions.

Table 1. *CoRT Breadth Thinking Skills Used in the Practical Lessons*

Skill Set	Skill Name	Explanation
The Ten CoRT Breadth Thinking Skills	PMI: Plus, Minus, Interesting	Rate an idea. Tell the pluses: the good things you like about it. Tell the minuses: the bad things about an idea – what you don't like about it. Tell the "interesting" aspects of the idea: aspects that are neither plus nor minus, but are connections to other ideas or might lead to other ideas.
	CAF: Consider All Factors	Tell all the factors in a situation. Consider factors that are not obvious and result from different perspectives in time (past, future) or from different people or environments.
	Rules	Generate rules for a situation.
	C & S: Consequence and Sequel	Determine the consequences or follow-ons to an event or situation. Consider the immediate effects, the short term consequences (1-5 years); the medium-term consequences (5-25 years); and the long-term effect (more than 25 years).
	AGO: Aims, Goals, and Objectives	Am *aim* refers to the general direction; a *goal* defines the final destination; an objective is a recognisable point of achievement. Determine the aims, goals and objectives that relate to your project.
	Planning	Develop a plan for your project brings together objectives (AGO), consequences (C&S), the factors involved (CAF), and the treatment of ideas (PMI).
	FIP: First Important Priorities	Determine the factors or objectives or consequences involved. Prioritize them.
	APC: Alternatives, Possibilities, Choices	Determine as many choices, alternatives, or possibilities as possible.
	Decisions	Use FIP and APC to make a decision.
	OPV: Other People's Views	Determine the viewpoints of other people related to your project or idea.

Table 2. *Selected Skills from Other CoRT Thinking Skills Sets Used in the Practical Lessons*

Skill Set	Skill Name	Explanation
Selected CoRT Organization Thinking Skills	Recognize	Recognition of what something is. This recognition allows one to use all the information already available about it. If one does not recognize something, one can do the following: 1) Obtain more information; 2) Guess and determine whether the guess fits; 3) Set up a way to determine which of several possibilities fits best.
	Analyze	Divide something into physical or conceptual parts to better understand it. Think about each part separately. Ask, how can I divide this into original (usually physical) or perceived (usually conceptual) parts?
	Compare	Comparing something to something else well-known to learn more about the first thing. When two things are very similar, look for differences, when two things appear different, look for similarities. Ask, "What is this like?" "How are two things similar?" "How are two things different?"
	Select	Selection involves finding something that meets your requirements. Ask: "What fits these requirements?" "Is there a good fit between the characteristics and the requirements?" "Which alternative fits the best?"
	Find Other Ways	There are multiple approaches and ways of considering things. Making a deliberate effort to find alternative ways of looking at things can improve thinking.
Selected CoRT Information and Feeling Thinking Skills	Clues	A clue is a single piece of information or fact statement that can be interpreted to provide more information. When separate clues are added together, even more information results.
	Contradictions	Information can be incorrect, making conclusions false. Sometimes pieces of information contradict each other. "Co" means looking for contradiction and "FCo" means looking for false conclusions.
	Guessing	When information is lacking, one may have to guess. The more information used in the guess, the more likely it will be correct. A guess based on a lot of information and prior happenings, is a small guess (SG). A guess based on little information or when the possibilities are numerous and none seems particularly better than others is a big guess (BG).

Design of the Mars Mysteries Lessons

The photographs used in the lessons were verified by being located on NASA websites. They were checked to ensure that the features in question were indeed present. Each NASA website has been documented in the references. Therefore, these anomalies exist in the NASA photos and are true mysteries, worthy of discussion and consideration through thinking skill lessons. Each lesson was designed to meet the needs of gifted students through the thinking skill practice and the high-interest area of Mars Mysteries, a topic that may lead to greater investigations.

The Mars Mysteries lessons of the practical articles in this issue of the *Journal of STEM Arts, Crafts, and Constructions* were conducted in a graduate-level course with typical adult graduate students, some of whom had been identified as gifted in their K-12 schooling and some of whom have disabilities. However, the specific disabilities addressed by each lesson may or may not have been present in the participants. These were demonstration lessons to show how lessons might be designed for gifted students who were twice-exceptional. Each practical lesson provides the responses that the participants generated and examples of the arts projects. The lessons lasted approximately 50 minutes each.

Table 3 shows the lesson topics, thinking skills used, disabilities addressed, and a brief description of the arts project. All Mars Mystery projects were integrated with the arts to allow the students creative self-expression, to maintain student focus, and help them stay motivated as well as apply their newly-gained knowledge and foster content retention. Integrating subjects with arts is one of the easiest yet effective ways to provide real-world application of the knowledge acquired and meaningful connections between the subjects (Cornett, 2015). Furthermore, the arts and the STEM

disciplines (Science, Technology, Engineering, and Mathematics) share the same core concept of inquiry-based learning and problem-solving (Booth, 2013). All National Core Arts Standards have corresponding scientific method steps and engineering design steps (Zhbanova, 2017), which suggests a deep connection between the STEM disciplines and the arts. The arts provide additional challenge that gifted students need (Gadanidis, Hughes, Cordy, 2011). Arts integration was also found to foster a heightened level of concentration (Gadanidis, Hughes, Cordy, 2011), which can be helpful to students with some exceptionalities and all students. Because of the additional benefits provided by the arts, all lessons described in the articles included arts and science integrated activities. Table 4 shows the Mars Mystery arts-integrated projects and the corresponding Arts Anchor standards and processes.

Table 3. *Instructional Aspects of the Lessons in the Practical Articles*

Authors of Practical Article	Mars Mystery	De Bono Thinking Skills	Exceptionalities Addressed	Arts Project
Rau & Becker, 2018	Pyramid or structure	CAF: Consider All Factors OPV: Other People's Views Analyze	English language learners Attention deficit disorder/with or without hyperactivity	Write **words to a song** that fits a common tune like "I'm a Little Teapot" to express ideas about Mars Mysteries.
McCoy-Parker, Benda, & Ebede, 2018	Glass tube or tunnel	FIP: First Important Priorities CAF: Consider All Factors Clues	Slow information processing speed Poor Fine Motor Skills	Create a **new, illustrated cereal box front** that has a Mars-related name and that relates to the Mars mystery of the glass tubes.
Zabel, Castello, & Makaula, 2018	Large landscape pictogram visible from above	Decisions Planning Recognize	Emotional issues Poor long-term or short-term memory	Write a one-page **science fiction story** related to a Mars Mystery and **illustrate it**
DeVore, Rafanello & Rafanello	Animal or animal statue	APC: Alternatives, Possibilities, Choices Compare Decisions	Dyslexia Dyscalculia	3D spatial creation project, using a **student-created rubbing** of an animal that can be compared to the original
Cox, Sova-Tower, & Wear	Body of water	AGO: Aims, Goals, & Objectives Select Planning	Autism or Asperger's syndrome Slow information processing speed	Create **scene or object** related to Mars Mystery from **recycled and paper items**.
Meyer, Griffin, & Butler	Animal skeleton	Guessing Rules PMI: Plus, Minus, Interesting	Attention deficit disorder/with or without hyperactivity Executive functioning	Create a **T-shirt design** that shows your views about the Mars Mystery
Pepanyan, Fisher, & Wallican-Green	Large face	AGO: Aims, Goals, Objectives Contradictions FIP: First Important Priorities	Executive functioning Poor Impulse Control	Make **humorous cartoons** with Mars image backgrounds and added art on top to show imagined scenarios of Mars.
Al-Hassan, Adebiyi, Iqtadar, & Atwood-Blaine	Human or humanoid figure	OPV: Other People's Views Find Other Ways PMI: Plus, Minus, Interesting	Poor long-term or short-term memory Hearing impairment, difficulty with auditory perception and processing	Design **Postcards** that explain the Mars Mysteries.

Table 4. *Arts Anchor Standards and Processes Addressed in the Projects*

Project	Arts Processes	Anchor Arts Standards
Pyramid or structure	Creating	#1. Generate and conceptualize artistic ideas and work.
		#2. Organize and develop artistic ideas and work.
	Performing	#4. Analyze, interpret, and select artistic work for presentation.
	Presenting	#5. Develop and refine artistic work for presentation.
	Producing	
	Responding	#7. Perceive and analyze artistic work.
	Connecting	#11. Relate artistic ideas and works with societal, cultural and historical context to deepen understanding.
Glass tube or tunnel	Creating	#1. Generate and conceptualize artistic ideas and work.
		#3. Refine and complete artistic work.
	Performing	#6. Convey meaning through the presentation of artistic work.
	Presenting	
	Producing	
	Responding	#7. Perceive and analyze artistic work.
		#9. Apply criteria to evaluate artistic work.
	Connecting	#10. Synthesize and relate knowledge and personal experiences to make art.
Large landscape pictogram visible from above	Creating	#1. Generate and conceptualize artistic ideas and work.
		#3. Refine and complete artistic work.
	Performing	#5. Develop and refine artistic work for presentation.
	Presenting	#6. Convey meaning through the presentation of artistic work.
	Producing	
	Responding	#7. Perceive and analyze artistic work.
		#8. Interpret intent and meaning in artistic work.
	Connecting	#11. Relate artistic ideas and works with societal, cultural and historical context to deepen understanding.
Animal or animal statue	Creating	#1. Generate and conceptualize artistic ideas and work.
		#3. Refine and complete artistic work.
	Performing	#5. Develop and refine artistic work for presentation.
	Presenting	#6. Convey meaning through the presentation of artistic work.
	Producing	
	Responding	#9. Apply criteria to evaluate artistic work.
	Connecting	#10. Synthesize and relate knowledge and personal experiences to make art.

Table 4 Continued. *Arts Anchor Standards and Processes Addressed in the Projects*

Project	Arts Processes	Anchor Arts Standards
Body of water	Creating	#1. Generate and conceptualize artistic ideas and work.
		#2. Organize and develop artistic ideas and work.
		#3. Refine and complete artistic work.
	Performing	#5. Develop and refine artistic work for presentation.
	Presenting	#6. Convey meaning through the presentation of artistic work.
	Producing	
	Responding	#7. Perceive and analyze artistic work.
		#9. Apply criteria to evaluate artistic work.
	Connecting	#11. Relate artistic ideas and works with societal, cultural and historical context to deepen understanding.
Animal skeleton	Creating	#1. Generate and conceptualize artistic ideas and work.
		#2. Organize and develop artistic ideas and work.
		#3. Refine and complete artistic work.
	Performing	#4. Analyze, interpret, and select artistic work for presentation.
	Presenting	#5. Develop and refine artistic work for presentation.
	Producing	#6. Convey meaning through the presentation of artistic work.
	Responding	#7. Perceive and analyze artistic work.
		#8. Interpret intent and meaning in artistic work.
		#9. Apply criteria to evaluate artistic work.
	Connecting	#10. Synthesize and relate knowledge and personal experiences to make art.
		#11. Relate artistic ideas and works with societal, cultural and historical context to deepen understanding.
Large face	Creating	#1. Generate and conceptualize artistic ideas and work.
		#2. Organize and develop artistic ideas and work.
		#3. Refine and complete artistic work.
	Performing	#4. Analyze, interpret, and select artistic work for presentation.
	Presenting	#5. Develop and refine artistic work for presentation.
	Producing	#6. Convey meaning through the presentation of artistic work.
	Responding	#7. Perceive and analyze artistic work.
		#8. Interpret intent and meaning in artistic work.
		#9. Apply criteria to evaluate artistic work.
	Connecting	#10. Synthesize and relate knowledge and personal experiences to make art.
		#11. Relate artistic ideas and works with societal, cultural and historical context to deepen understanding.
Human or humanoid figure	Creating	#1. Generate and conceptualize artistic ideas and work.
		#3. Refine and complete artistic work.
	Performing	#6. Convey meaning through the presentation of artistic work.
	Presenting	
	Producing	
	Responding	#8. Interpret intent and meaning in artistic work.
		#9. Apply criteria to evaluate artistic work.
	Connecting	#10. Synthesize and relate knowledge and personal experiences to make art.

Conclusion

Rau and Becker (2018) found that application of the de Bono CoRT Thinking Skills and the integration of arts with intriguing scientific concepts had positive effects on the variety and depth of students' thoughts. Students in this lesson were able to broaden their initial thoughts about the pyramids and structures on Mars through the use of the de Bono CoRT Breadth Thinking Skills. In addition, sharing with the whole group and hearing a variety of perspectives stretched their thinking. Students, then, had the opportunity to apply this thinking in an arts integration project in which they wrote song lyrics, appearing to further engage them in this intellectual process. Comments that were expressed by students throughout the lesson revealed their enjoyment of the arts integration activity" (p. 24).

DeVore, Rafanello and Rafanello (2018) discovered that using de Bono thinking skills and employing art to apply and express the new learning fostered production of a very large number of diverse and unique ideas. The participants entertained the possibility of live animals on Mars through application of the CoRT thinking skills. The arts-integrated project involving a crayon-rubbing activity in which the students compared their artwork with an image of a possible crab from Mars, provided an opportunity to make a somewhat distant topic of life in the outer space easier for students to relate to and to practice comparing, identifying alternatives, and making choices.

The lesson conducted by Pepanyan, Fisher and Wallican-Green (2018) involved exploration of another Mars mystery of faces in NASA photographs through applying another set of de Bono thinking skills accompanied by an arts-integrated activity of creating thematic cartoons explaining the origin of the anomalous Mars faces. The use of de Bono thinking skills resulted in students broadening their thinking to include a greater variety of possible explanations of the Mars faces. Although the participants demonstrated a stronger preference of realistic cartoons, the arts-integrated activity resulted in a variety of creative ideas and allowed the students to express themselves.

Another set of de Bono CoRT thinking skills was applied in a lesson by Al-Hassan, Adebiyi, Iqtadar, and Atwood-Blaine (2018). Among other activities, the lesson involved drawing to express the ideas generated through the application of de Bono thinking skills and an iPad game aimed to increase the reasoning ability and focus of the students through interaction with the colorful and pictorial game. The participants investigated the mystery of possible humanoids in the photographs made by Mars Curiosity Rover. The results of the lesson demonstrate that de Bono thinking skills foster heightened levels of student engagement, creative expression, and a wide range of ideas regarding the possibility of humanoids on Mars. The students also indicated that technology and arts integration promoted positive atmosphere and collaboration.

One of the main goals of a lesson by McCoy-Parker, Benda, and Ebede (2018) was to enhance the participants' critical and creative thinking skills through applying three of the de Bono thinking skills while exploring possible solutions to a Mars glass-tube mystery. During the lesson, the participants collaborated joyfully and practiced using the thinking skills embedded in graphic organizers and an arts-integrated activity of designing a cereal box and the name of the cereal. The cereal boxes reflected and expressed the students' individualities and fostered creative thinking; they also demonstrated a broadened range of ideas generated by the students. The cereal box design project also provided a real-life application of the student learning. The results of this lesson support that CoRT Breadth thinking skills effectively enhance student critical thinking skills, particularly, analysis of information.

According to the results of the lesson based on another set of de Bono Breadth Thinking skills by Cox, Sova-Tower and Wear (2018), the CoRT thinking skills joined with investigating an intriguing problem are an effective way to increase student confidence and level of engagement while learning. The step-by-step guidelines and directions of how to efficiently apply the de Bono thinking skills and an arts-integrated activity of developing three-dimensional models, were thoroughly enjoyed by the students while generating ideas and propositions regarding the presence of water on Mars. The model-making activity promoted generation of a wide variety of extremely creative ideas and unique application of the craft and recycled materials.

The next lesson conducted by Zabel, Castello, and Makaula (2018) focused on another set of three de Bono thinking skills that were introduced through a graphic organizer and an arts-integrated activity. The participants examined the pictograms on the surface of Mars in comparison to the ones from Earth and applied their newly-applied knowledge about the planet in a literary arts-integrated activity of fiction story writing. The incorporation of the CoRT thinking skills resulted in students generating a variety of interpretations of the pictograms and, subsequently, developing creative, more detailed stories with coherent plots.

The lesson developed and conducted by Meyer, Griffin, and Butler (2018) focused on another Mars mystery. The students used three of the de Bono thinking skills to investigate the mystery of what appear to be animal skeletons in NASA photographs of the surface of the planet. One of the main goals of this lesson was application and practice of the critical thinking skill in a thought-provoking real-life related context. A graphic organizer was used to help students apply the selected CoRT thinking skills. This lesson also incorporated an arts-integrated project that further expanded student critical thinking and served as means for constructing personal meaning. The graphic organizer served as an efficient tool to prepare and facilitate meaningful discussions and as a catalyst of generating creative T-shirt designs.

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