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# An Inter- and Intra-Disciplinary Lesson

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The literature is replete with the importance of placing emphasis on intra- and inter-disciplinary connections within a lesson plan, learning experience, or unit of study. The ability to understand that the content or skill learned in one context has application to other contexts makes the learning more valuable and usable. The teachers' and students' abilities to form disciplinary connections is a "practiced art" that needs to be integrated consistently as a feature of all lessons.

Following is a design template illustrating where in a lesson, inter- and intra-disciplinary connections can be made to enhance and transfer the skill being taught. The lesson plan has been designed using a Direct Instruction pedagogical practice or model of teaching. The major purpose of a Direct Instruction lesson plan is the teaching and learning of a skill or process. Teaching to transfer refers to the fact that students can apply a skill learned in one context to other contexts. In this case, a skill is introduced at the start of a Direct Instruction lesson using one subject area or topic as the anchor for demonstration. The skill is then woven within, between, and across topic areas using inter- and intra-disciplinary connections. The practice and application of the same skill in many different contexts and content areas provides for the transfer of knowledge on three levels: procedural, conceptual, and metacognitive. The sample lesson plan provided articulates how the same skill can be taught and enhanced through the application of inter- and intra-disciplinary connections.

The overarching structure of any lesson plan is the creation of a learning objective. A learning objective is a succinct articulation of the key knowledge, skills, and outcomes students are to encounter throughout the lesson plan. A comprehensive learning objective is written using four distinct components. A definition and description of each component is outlined below.

- **Thinking Skill** – Thinking skills represent the cognitive process(es) that students will engage in during the learning experience. In a Direct Instruction lesson, the focus or driving force of the learning experience is on the teaching and learning of this process or skill.
- **Content** – The content of a learning objective is represented in the standard or the core discipline being presented during the learning experience. The content should be aligned directly with the standard(s) selected for instruction and should reinforce AND extend the disciplinary core content.

- **Resources** – The resources articulated within a learning objective represent the materials that the students will need in order to engage with and/or activate the content. Resources in a learning objective should allow for the use of multiple modalities and access to acquire knowledge.
- **Product** – The product of a learning objective can also be described as the output, the outcome, or the means by which students are provided an opportunity to "show what they know and can do" in relationship to the objective presented in the lesson. The product must be measurable and aligned with both the content and skills articulated in the learning objective.

**Sample Lesson Plan**

Learning Objective: Students will be able to **prove with evidence** (thinking skill), the **impact** (prompt of depth) of **context** (prompt of complexity) on the plot or problem articulated in a story (CCSS content connection). Students will read a **story in the anthology** (resource) in order to state their evidence in a **written narrative** (product).

| Sequence of the Lesson | Intra-Disciplinary Connection | Inter-Disciplinary Connection |
|---|---|---|
| <u>*Motivation:*</u><br><br>Discuss the importance of proof or evidence. | Discuss how authors need to verify alternative vocabulary to define "prove" and "evidence." | The value of prove/evidence by scientists: physicist, biologists, etc. |
| <u>*Demonstration:*</u><br><br>Demonstrate for students how to prove with evidence using the following steps:<br>• Identify the problem<br>• State the need to solve the problem<br>• Find evidence as to how the problem can be resolved | Discuss how authors state problems and their means to resolution. | Demonstrate how a famous (engineer, instructor) individual gathered evidence to solve a problem. |
| <u>*Structured Practice:*</u><br><br>Provide students with an opportunity to use the skill | How authors use action words to prove the problem in a story. | Read an autobiography or biography detailing how an individual collected evidence to prove an idea. |

| | | |
|---|---|---|
| of prove with evidence in a fable or story.<br><br>Ask students the question: What evidence can you find in the text to prove how the author resolved the plot or problem in the story? | Discuss how setting validates the environment for the character's actions. | |
| *Guided Practice:*<br><br>Provide students with the resources to prove a statement about the plot or problem in a story: Prove with evidence that the protagonist in the story was a positive influence on the plot or the resolution of a problem in the story. | Distribute a review of a book or movie.<br><br>Ask students what evidence was used to verify the point of view or perspective in the review of the author's work. | Select a historic or contemporary political, economic, or social point of view.<br><br>Inform students to research the evidence that supports a positive or negative response to the point of view. |
| *Independent Practice:*<br><br>Inform students that they must define a point of view regarding a character and collect evidence to substantiate their perspective of the character's impact on context and plot. | Identify how an author has used evidence to prove the efficacy of their work (theme, characters, plot, etc.). | Inform students to pose an argument and to prove with evidence potential solutions to that argument. |

The purpose of providing the sample lesson plan outlined above is threefold: (a) to stimulate conversation related to the need to integrate inter- and intra-disciplinary connections with a learning experience, (b) to highlight how a lesson plan can be modified and adapted to include within, between, and across disciplinary connections, and (c) to demonstrate the concept of teaching to transfer regarding a skill or process.

**An Odyssey of the Mind**

Jason Meth

"You have one minute to think and two minutes to respond. You can ask questions, however your time will continue. You will respond in sequence. You cannot skip your turn, or repeat, or pass. If one team member is stuck, the whole team is stuck. Your problem is to name something that changes something else and tell how it changes it." Your time begins … now!

These are typical instructions that teams receive when participating in a "Spontaneous Problem" at an Odyssey of the Mind tournament. My heart rate goes up a bit just reading those directions, and I can only imagine how my students must feel. They are being asked to think creatively, with little contemplation, while being scored on the quality of their responses as compared to other teams. Creative thinking, as a team sport! In addition, "Long Term" problems are distributed each year and are rooted in language arts, physics, mechanics, art, and engineering, but usually have aspects of each required in a "solution." Problems are solved by 5-7 member teams who choose at the onset of each year which problem they will work on.

I was introduced to Odyssey of the Mind, quite by accident, a little over ten years ago. A new after-school enrichment program was using my room one day a week. I greeted this new "team" of students and their "coach" with the usual skepticism of anyone encroaching on my sacred classroom space. Over the course of the next few weeks, I progressed from glaring over my computer monitor, to brief interjections, to joining the circle. I was a full-fledged assistant coach within the month and my Odyssey was about to begin.

Odyssey of the Mind has its roots in the classroom of Dr. Sam Micklus at Rowan University, in Glassboro, New Jersey. In the early 1970's Dr. Sam, as he's affectionately known, challenged his industrial design class to solve open-ended problems in small teams. Word spread of his challenges and local students soon became involved. In 1978 Dr. Sam created challenges for middle and high school students and a local competition emerged. By 1980 teams from other states, and eventually other countries, began to form and Creative Competitions Inc., a small family business, was created to facilitate the tournaments. Today Odyssey of the Mind has thousands of teams supported by associations in every state and 25 countries around the world.

Dr. Sam and the founders of the Odyssey program understood the value of STEAM education long before there was an acronym. Today STEAM education is beginning to flourish. Administrators have recognized its value, and educators are teaching curriculums that acknowledge the connections between the disciplines. Science, technology, engineering, the arts, and math are not individual subjects. They rely on each other for their existence.

Although solving an Odyssey of the Mind problem can be a unique process, it unavoidably culminates in a competition. I struggled with this at first. Competition was not a part of my childhood, and winning or losing both felt extreme. I came to learn however that adults and kids have very different responses to competition. They mostly find the competition aspect exciting and motivational. Regardless of the results. It is the adults that agonize over a loss. Although the kids may have an emotional reaction, by dinner, and definitely after a consolation ice cream sundae, they easily turn their attention to the positive aspects of the experience.

I also worried whether it was beneficial that my students work be measured against others. Isn't creativity highly subjective anyway? These questions are not easily answered, but with the right perspective, competition itself, along with measured results, provides valuable insights. Odyssey tries to address the subjectivity of judging a creative problem by creating a highly detailed rubric for scoring. Students are asked to create projects that go well beyond the big ideas and highlight the details.

I have been fortunate to have had some exceptional teams over the years and have worked with some amazing kids. In discussing the program, however, one of the misconceptions I have frequently faced is the belief that Odyssey is a gifted program. Odyssey can be strong enrichment for capable children, but it is not exclusively a gifted program. A strong Odyssey team should include a writer, an artist, and an engineer. There should be linear and divergent thinkers. Perhaps most importantly, you need kids who bring enthusiasm and a willingness to work hard. A team member with a great work ethic brings a special form of giftedness.

It's wonderful when kids are able to work collaboratively, and for those who do not come with those tools, the goal is to teach these skills. Odyssey projects serve well to foster team-work and trust among peers. I look for the moments along the way when I see unique contributions from each student. I use those moments to highlight that the project could not be successful without the particular talent that each team member brings. I find that when kids are keenly aware of their strengths and how that qualifies them to contribute, they conflict less with their teammates. They are confident in their contributions regardless of whether they are big or small. Conversely, they also need to be aware of the skills they are developing and where they will be expected to contribute more in the future.

Odyssey is by no means the perfect program. Each year there is one problem that is designated for kindergarten through second grade and the other five problems are distributed to students in third grade through high school. While the lack of differentiated material contributes to the challenge, it can be difficult for younger students to decipher problems independently. One of the cornerstone principles of the program is to give team members **no** “outside assistance.” In other words, **no** help with ideas or the creation of materials related to their solutions. While this precept is one of the programs biggest strengths, the lack of leveled material is an inherent weakness. It is up to the coaches to facilitate the students’ understanding of the materials without providing hints or suggestions.

The Odyssey program is as special as you make it and the skills that are fostered are as strong as the skills that you teach. What attracted me to Odyssey, and continues to keep me participating, is that the program provides an opportunity to apply educational practices that I am passionate about with a small and less formal class. As a specialist in project-based learning, I have adapted my practice around state social studies standards. While the idea of a student-driven curriculum can sound intriguing, the reality is that I take great pride that my classroom lessons align with standards.

For me, coaching and competing in Odyssey has helped me make several leaps “out-of-the-box.” I’ve learned to value departing from the structure I usually embrace. Creating lesson plans would be pointless in Odyssey because the ideas are generated entirely by the kids. In fact, planning what they should do at the next meeting would be a huge disservice. Homework assignments are written up on the spot in response to the ideas generated during the meetings. It runs counter to some of the training teachers receive and yet it has been the incubator for much of my professional development.

If you think you may be interested in Odyssey of the Mind there is much more information on the Web. This grassroots movement has sustained itself on a steady stream of overworked, mostly volunteer, teacher and parent coaches who each have their own story to tell. The story I tell my kids is that if they were to win first place, at the Odyssey World Finals, a helicopter would land outside the arena, where I would be airlifted out, waving to them from the sky, never to be seen again. I can’t believe they think I’m kidding!

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## Asking Questions Across the Knowledge Domains

Jessica Manzone and Julia Nyberg

Since the dawn of civilization, human beings have been fueled with the quest to discover, to move beyond the boundaries of the familiar and into the world of the unknown. *Metaphysics*, written by Aristotle in 350 B.C.E begins with the statement: "All men by nature desire to know." We ventured out of our caves and off of our planet seeking answers to questions such as (a) What is the big idea of a problem or situation?, (b) What tools can be used or invented to help solve the problem?, and (c) What patterns exist in this problem that can aide in future solutions? Although the Common Core State Standards (2010) provide a framework for the knowledge and skills students should acquire in their journey towards intellectual discovery, educational theorists have (and will continue) to debate the essential question: What does it really mean "to know"?

Content knowledge proficiency is dependent upon the development of four distinct knowledge domains: factual, procedural, conceptual, and metacognitive. The means in which we develop content knowledge proficiency during instruction is through the development and dissemination of questions. Therefore, a specific syntax which frames a question encourages a specific type of content knowledge development. Questions then become more than just "those things" we ask students to check for understanding after a class discussion or to complete at the end of a chapter or lesson. The asking of questions becomes the vehicle for differentiating the learning experience for students based on needs, interests, and abilities. Teachers' knowledge and understanding of the art of questions (their types and uses) is paramount to their ability to apply them as a strategy for differentiating both curriculum and instruction. This article will address factual, procedural, conceptual, and metacognitive knowledge development and questioning, using Aristotle as the topic.

### The Factual Knowledge Domain

Factual knowledge development relies on viewing details in terms of facts, producing a correct or incorrect answer. Factual knowledge domain questions can also be defined as "convergent" or closed-ended questions, due to the fact that the answers to these questions demand a right answer or series of right answers. "Where was Aristotle born?" is a factual question that prompts a true or false response. Aristotle was born in Stagira, Chalcidice, which is around 55km east of modern-day Thessaloniki (McLeisch, 1999). That answer cannot be changed, altered, or debated. It can and must be substantiated, validated, supported, and justified with citations and references. The question posed above is fixed, substantiated by details, and not subject to variability, personal interpretation, or theory. Other questions that fall into the factual knowledge domain include:

- How old was Aristotle at his death?
- When was Aristotle born?
- Which future world leader was under his tutelage?

**The Procedural Knowledge Domain**

Procedural knowledge emphasizes the process, algorithms, and rules within a domain to perform a task. A process can be further defined as the series of steps necessary to accomplish an action or complete a task. The teaching and learning of procedural knowledge requires an analysis of the process to determine its static or fluid nature. The sequence or procedure for most processes exist on a continuum between a fixed versus flexible set of steps. The rigidity or malleability of the nature of the process directly impacts the activation and application of procedural knowledge. Take for example, the difference between cooking and baking. The process needed to make a homemade marinara sauce is much more flexible and forgiving then the explicit and exacting sequence necessary to bake a triple chocolate cake. Both require ingredients and recipes, but the degree to which they need to be followed in order to create an edible product varies greatly.

Aristotle developed a procedure for developing a logical system:

Every C is B<br>
Every C is A<br>
So, some A is B

Another example of an Aristotelian logical procedure is:

No C is B<br>
Every A is C<br>
So, some A is not B

Examples of procedures that surface in the Common Core Content standards include this list below. It becomes incumbent on the part of the teacher as well as the student to examine the types of processes embedded in the content area domains. Order of Operations for example might require an explicit set of steps formulated into a fixed set of procedures. Conversely, the writing of a complex sentence can be fluid in nature, accounting for things such as author's tone, word selection, interpretation, and meaning. The identification and nature of a process directly impacts one's ability to successfully engage with the process. Asking students questions that trigger a metacognitive conversation about the structure and needs of a process is a great way to develop and sustain procedural knowledge.

- The Order of Operations
- Writing a complex sentence
- Ordering fractions from least to greatest
- Writing an iambic pentameter poem

To facilitate the development of procedural content knowledge, Plato may have asked Aristotle questions such as:

- How would you deconstruct the process you took to solve the problem? Would you argue that the process was fixed or flexible?
- When would you translate the procedure you used to another situation or scenario?
- What impact does this step have on the process? What would happen if we modified or removed the step? How much leeway did you have to alter the steps or the order of the steps?

**The Conceptual Knowledge Domain**

Conceptual knowledge development requires the learner to investigate and examine according to parts, categories, or relationships. Often, the answer must be proved with evidence and allows for a degree of theory and personal interpretation. Conceptual knowledge questions are divergent and open-ended in design. They require the respondents to synthesize key pieces of information, summarize facts into generalizations and thesis statements, and substantiate these arguments and claims with evidence from credible and reliable sources. For example, questions such as, “What impact did Aristotle have on Alexander the Great’s motives?” or “What was the origin of Aristotle’s development of virtue ethics?” are all questions that require analysis, synthesis, or evaluation. The teaching of conceptual knowledge requires an understanding of (a) part-whole relationships, (b) universal concepts, (c) big ideas, and (d) differences between abstract and concrete information. The development of conceptual knowledge may generate more questions from the learner, as conceptual knowledge development has the potential to be abstract as opposed to factual knowledge development, which is concrete. The formation of a series of follow-up questions can emerge from the response to conceptual knowledge domain questions. This question chain can serve as a catalyst for student independent study, self-directed inquiry, and extension opportunities.

**The Metacognitive Knowledge Domain**

The root word 'meta' means beyond, therefore, metacognition references the process of "knowing about knowing" (Mecalfe & Shimamura, 1994). The asking of metacognitive questions falls under the "novelty" domain of the Gifted and Talented Education Standards in the state of California. Strategies such as developing a self-identity, recognizing and capitalizing on abilities, and engaging in the intellectual struggle are all part of developing metacognitive knowledge. The explicit teaching of these strategies is known as Learning-to-Learn, and focuses on having students ask questions about their application of content knowledge and thinking processes. If we were to ask Aristotle about *how* he used particular strategies for learning and *when* he applied those strategies, we would be engaging in a conversation with him about his metacognition (Schraw, 1998).

Questions that address *how* Aristotle used learning strategies may include:

- Describe the process you used to solve the problem?
- How would you translate the steps you took to cognitively address this topic to another colleague?
- What would you alter in your process to make improvements to the solution?

Questions that address *when* Aristotle used particular learning strategies may include:

- What motive did you have for making that specific decision while solving the problem?
- What are the origins that contributed to your thinking process?
- When could you use the knowledge gained from this process in another situation?

As you can see, the topic of Aristotle has been addressed from a variety of proficiency perspectives, allowing the learner to have different pathways to access the content to develop knowledge. The more knowledge domains targeted in the planning and execution of a learning experience of lesson plan, the more differentiated the experience becomes. This is due to the fact that asking strategic questions across the knowledge domains provides teachers with the opportunity to target questions based on the needs, interests, abilities, and readiness levels of the students in the class. The inclusion of each knowledge domain into the lesson plan also provides for an extension of the core content standards that tantalizes students' interest and provides opportunities for curiosity and independent inquiry. This type of differentiated planning and lesson plan development can occur using a table. Think about how your knowledge of Aristotle is increased as we move beyond the factual knowledge domain.

| TOPIC: ***Aristotle*** | **CONTENT** | **QUESTIONS** |
|---|---|---|
| **FACTUAL KNOWLEDGE** | *Aristotle's Life* | |
| **PROCEDURAL KNOWLEDGE** | *Aristotelian Logic* | |
| **CONCEPTUAL KNOWLEDGE** | *Aristotle's Impact* | |
| **METACOGNITIVE KNOWLEDGE** | *Aristotle's thinking process* | |

The same process can be applied to any content area you are teaching as a means to develop knowledge proficiency and expertise in a topic. For example, let's address multiplication using the same method. As lessons are constructed using a cross-domain approach, several factors occur: (a) the notion of what it means "to know" expands, (b) content becomes accessible to all learners, and (c) student interest, motivation, and personal connections to the core content increase.

| TOPIC: ***Multiplication*** | **CONTENT** | **QUESTIONS** |
|---|---|---|
| **FACTUAL KNOWLEDGE** | *Multiplication facts* | *"What is 4x2?"* |
| **PROCEDURAL KNOWLEDGE** | *Multiplying two digit numbers* | *"What steps do we have to take if we multiply 4x22? How do the steps change from when we multiply 4x2?"* |
| **CONCEPTUAL KNOWLEDGE** | *The relationship multiplication has to division* | *"How does multiplication relate to division? What paradoxes exist between the two processes?"* |
| **METACOGNITIVE KNOWLEDGE** | *Thinking about the process of multiplying* | *"When did you know to regroup when multiplying? Would you describe your thinking process as a whole to part process or a part to whole process?"* |

Now it's time to transfer theory into practice! Select a core content standard(s) related to an upcoming unit of study. Deconstruct the topic from your grade level, using the table below, to include the factual, procedural, conceptual, and metacognitive domains. Think about the additional resources and materials that you will need in order to execute the learning experience.

| TOPIC: | CONTENT | QUESTIONS |
|---|---|---|
| **FACTUAL KNOWLEDGE** | | |
| **PROCEDURAL KNOWLEDGE** | | |
| **CONCEPTUAL KNOWLEDGE** | | |
| **METACOGNITIVE KNOWLEDGE** | | |

Seminal as well as contemporary theorists continue to question what it means “to know” or to become expert like in a subject area or discipline. Educators, in any grade level or content area, can promote equal access to content, academic rigor, and sophisticated levels of understanding by making connections across the knowledge domains. The art of questioning is a skill that can be demonstrated and modeled on the part of the teacher as the means of digging into content and processes. When teachers foster opportunities within the classroom for students to engage in asking questions across the knowledge domains, self-regulated, self-engaged, and independent thinkers are born.

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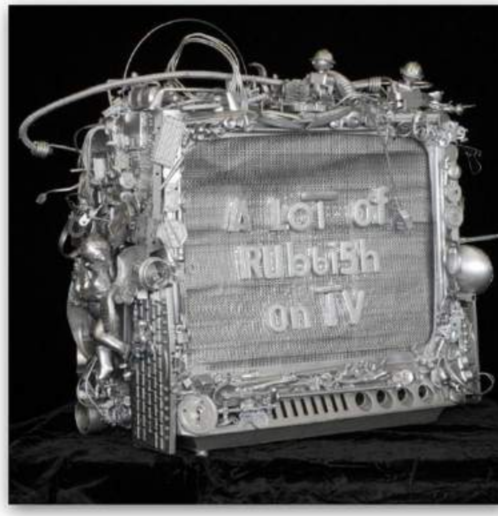
**Objet Trouve**

Krista Landgraf




Have you ever wondered how you could integrate art into your lessons? Have you personally missed the adventure and creativity that comes from dappling with our more creative side? How can you justify spending time away from our test-driven classrooms with time spent with art?

Welcome to the world of objet trouve. The French definition of aesthetical value from natural or discarded objects found by chance. My class is in the process of learning about our natural resources in science. We are becoming experts in the fields of Engineering, Environmentalism, and Conservationism.

As we continue to explore, I thought this would be the perfect opportunity to integrate the art of creativity with and the philosophy of aesthetics. We began with conversations and discussions revolving around questions such as: What is aesthetics? How can another man's trash become another man's treasure? How can we recycle to create something of beauty?

The assignment will be to create an aesthetically pleasing piece of art that will reside in the planter outside of our classroom. All the items used in its construction must be from found recyclable objects. We are going to go on an expedition throughout the campus and our homes collecting recyclables with which we can create a sculpture for our school garden.

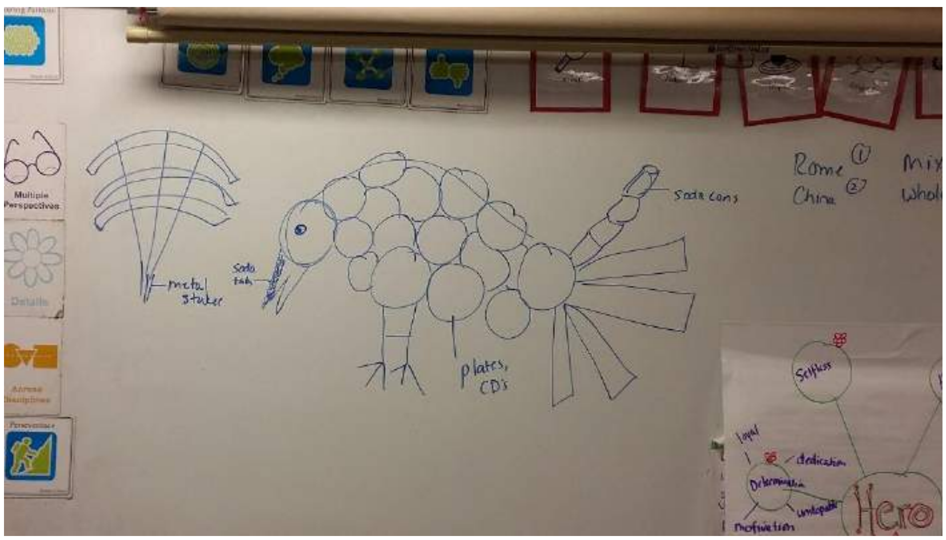
The class looked at various examples online to help determine what we would create. We chose a large bird.

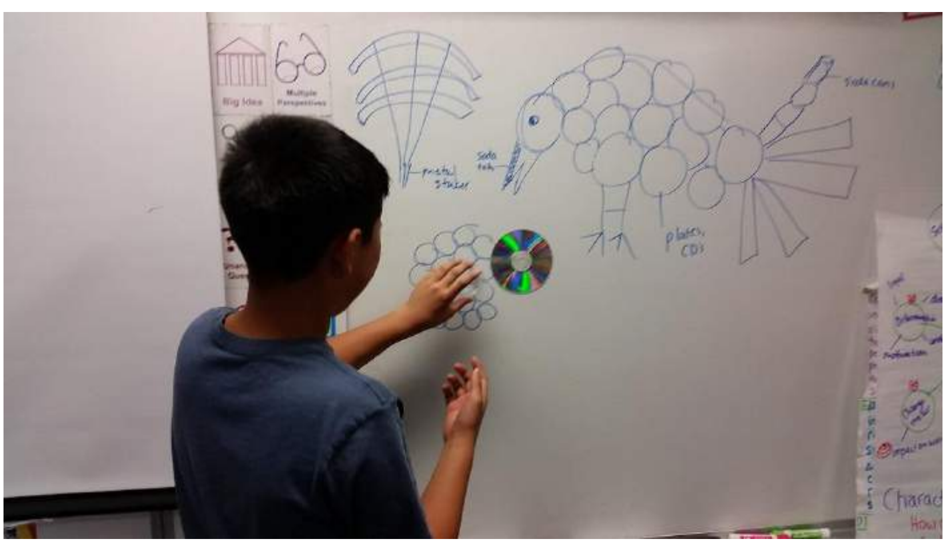
Once the initial idea was agreed upon, we had to tackle what materials we would need. The major criteria we looked at included:

- Weather proof/resistance
- Size
- Feasibility

We decided upon plastic plates, lids, cans, cd's pop top tabs, bottle caps for the bird body, tail and beak. We need a structural frame. We have a couple of old metal brooms that we are going to recycle and hula hoops cut in half to create a skeleton. Students also suggested old garden trellises. We are going to check and verify the engineering of our sculpture as we begin assembly. When completed we will spray paint, and place in a planter outside of our classroom. Each student will complete some aspect of the bird individually, sign and date their contribution. The class is very excited to leave an artistic, aesthetic creation for future students to enjoy.

*Krista Landgraf and her 6th-grade class from Country Springs Elementary, Chino Hills, CA*



**Robotics and Coding: Fostering Student Engagement**

Scott H. Wilson

*Abstract*: Coding and the use of robotics will be discussed in this paper along with statistical evidence suggesting the high impact and importance in education. Robots have a wide range of application in areas, such as literature, math, science, art, writing, and social studies among a few. 40% of schools teach computer programming. With that said, by 2018, the U.S. will have more than 1.2 million unfulfilled STEM jobs because there will not be enough qualified workers to fill them. The paper's goal is to communicate the necessity of integrating coding and robotics into the curriculum for K-12 students and help explain that STEM prepares students for their future.

*Keywords: coding, robotics, stem, steam, computer programming*

It is easy to say that we are living in exciting times in the world of education. The 21st century is upon us, and with that said, new pendulum swings have given rise to creativity and innovation in the school setting. What is the overarching goal of teaching day to day? Getting high test scores? Responding to intervention? Creating attainable goals for students? All of these are worthy goals, but most importantly is getting students to want to come to school every day. Making learning fun is something that is missing from our standards and our curriculum and must be implemented by each teacher in a personalized meaningful way. One way to engage students is through the use of robotics and coding in the classroom. According to Mauch (2001), "many robotics kits, such as the LEGO Mindstorms NXT kits, remind children of toys they know from at home and thus immediately engage them in a playful way and keep them engaged for extended time periods."

Studies on the subject have concluded that technology teachers face a number of challenges within the STEM fields, like teaching students how to solve problems and providing them with the skills they'll need to succeed at non-scripted jobs or jobs that may not exist yet (DiMaria, 2016). This paper attempts to build on earlier reports by advocating for the necessary additions of coding and robotics as part of our standards, thus making it a priority in all classrooms at all levels. Still other studies indicate that:

> *Although the world is rapidly changing, public education has maintained almost the same system since its introduction to the world [3], though educational reform efforts have been made around the world, the trouble lies in the fact that the majority of schools are trying to prepare students for the future by continuing what was done in the past.* (Robinson, 2010)

**Robots and Innovation in the Classroom**

When educators think of STEM or STEAM, they think of integrating Science, Technology, Engineering, Arts, and Math into the curriculum. The U.S. Department of Commerce estimates that jobs in STEM will grow 17% by 2018. Eguchi (2014) states:

> *Educational robotics is an effective learning tool for project-based learning where STEM, coding, computer thinking and engineering skills are all integrated in one project. Robotics provides opportunities for students to explore how technology works in real life, all with one tool through the act of making.*

When students are allowed to explore and tinker, they begin to think critically about the world around them and ask questions. STEM and coding are all about exploring, failing, rethinking, and eventually solving real world problems. Students want a hands on experience with their education. They want real world examples to help shape their understandings. What is impressive about robotics and coding is that many subjects can be taught and understood in an engaging, fun, and unique experience. The following section gives an example of how robotics and coding can be integrated into a variety of subjects through hands-on projects.

**Ozobots ([http://ozobot.com/](http://ozobot.com/))**

A great place to start in elementary school with robotics and coding is through the use of Ozobots. Ozobots are tiny robots that can be coded either with colored markers or using block-based programing. Students can easily follow the predetermined codes that allow the robot to move in a variety of ways. Students are engaged and excited to come to class to create with their Ozobots.

So what exactly can you do with Ozobots? Ozobots are the world's smallest smart robot. (2017) This right brain – left brain integrating bot builds both creativity and coding skills in ages 6 and up. Advance from basic color coding to intermediate block-based programming with Bit (Fig. 1). The site contains a plethora of free lesson plans that teach a variety of subjects. For example, the site has a literacy lesson on fairy tales. Students gather into groups and read a stories from Grimms Fairy Tales (2013). After reading, students decide who the main character is and discuss character traits. They then build a story map with Ozobot playing the main character. Students decide what codes to give Ozobot to illustrate the main characters movements and behaviors. The creativity is left up to the students as to how their 3D story map will look like as Ozobot moves through the story.

**Figure 1 Ozobot**

Another lesson is on math, teaching area and perimeter. Students are given a challenge with multiple rectangles. The goal is to find the shortest route for Ozobot to go around, thus introducing concepts, such as perimeter and constrained optimization.  There is also a free lesson in Social Studies where students use Ozobot to recreate Ferdinand Magellan's journey. Students label different parts of word geography.

**Conclusion**

The example of using Ozobots is just one avenue in exploring robotics and coding in education. There are so many more innovative projects for teachers to get their hands on. With the inundation of social media and websites, such as gofundme and donorschoose, teachers have options to secure these robots in their very own classrooms. It is imperative that school districts, schools, and most importantly-teachers jump into coding and robotics as the need for jobs is growing. STEM teaching gives students the creativity they desire to solve problems. STEM addresses the 4 c's that are crucial in education today, which are; creativity, collaboration, communication, and critical thinking. Coding is our future. Coding and the IT world touches every industry we have. Teaching kids to code through robotics will give them the skill set and confidence they need to compete in a future job market that may not exist as this article is written.

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**Start with Student Strengths to Promote Learning**

Miriam Singer

Many people strive to improve their lives and grow through goal setting. They look at the negatives and think about how to eradicate them. A few pounds too many? No more chocolate. Strapped for money? No more dining out. Procrastinating too much? No more putting things off (I'll do them soon, I swear!).

The reason why these well-intentioned resolutions often do not have staying power is because they are firmly entrenched in a place of dissatisfaction, rooted in a negative focus. Notice that the answer to all the previous problems and qualms start with the word 'no.'

If one were instead to focus on building on strengths that already exist in one's life, or on using a strength to target an area for improvement, the results would be decidedly different. If one were open to the power of 'yes,' and to building on the positive strengths already existing in one's life, the process of life improvement would be an entirely different one, an empowering one.

Many of the children at my school, a school where students are twice-exceptional (presenting with gifts and learning disabilities simultaneously), have been cast in light of their "deficiencies," and told that "you cannot do this" or "you are not enough." While it is true that they are not neurotypical, and that they process information more slowly or differently, they have so many strengths to be celebrated that we use these as access points to learning and engagement. Strengths-based education is predicated on the belief that every child has the potential to learn, and that the best way to progress in learning is through a positive lens.

This strength-based lens can and should be used in your teaching practice. Think about your teaching, and take a look at your students. Notice where you see students' strengths. Take these strengths and welcome them into your classroom. Students will delight in exploring their powerful minds and abilities, and their engagement and ideas will soar.

Below, find a few tips for how to get started in creating your very own strength-based community in your classroom.

**Find Out Where Your Students' Strengths Lie**

In order to harness student strengths, you need to accurately identify what the students' strengths are. There are a variety of tools and informative diagnostics that can be utilized for this purpose. One such tool is educational psychologist Howard Gardner's theory of multiple intelligences, which contends that intelligence does not reside in one or two domains, but multiple arenas where smarts can emerge. His list, comprised of seven types of intelligences, includes musical, visual, verbal, mathematical/logical, kinesthetic, interpersonal, intrapersonal, naturalistic, and existential. You can use this online tool with your students: (https://www.edutopia.org/multiple-intelligences-assessment).

An educator can also look at strengths in learning preferences, social strengths, and emotional strengths. Education Professor Robin Schader created a diagnostic called "My Learning Print" that helps educators and their students think about strengths in the classroom (http://gifted.uconn.edu/wp-content/uploads/sites/961/2015/09/My_LearningPrint.pdf).

**Honor and Develop the Strengths that You Discover**

Now that you've found areas where your students excel and their learning preferences, you have reached the point where you use this information to inform your teaching. Think about ways that you can differentiate your instruction to make it a meaningful experience for a variety of learning strengths, and where a strength can be incorporated to address a student's area of need. Some students learn well by listening, but others learn well by viewing, building, speaking, or even teaching others themselves. This idea is also important during independent and group learning times. Could there be multiple processes to learn the same content that work well for different students in your class? For instance, if your students are learning about photosynthesis, some students might benefit from watching a video, while other might do better reading a comic about the process. And do not forget to include student strengths at the end of the process, when assessing student learning. There are many different ways to display mastery. Embed a student's strengths into every part of the learning experience and watch the strengths and the student's engagement increase before your eyes.

**Address Areas of Need Using Strengths as an Entry-point**

This is not to suggest that you neglect areas that they need to build or develop. In many cases, you can use an existing strength or interest to target these areas of need. For instance, a child who has difficulty learning to write letters, but who is an excellent builder, should be encouraged to build letters using clay or pipe cleaners. Furthermore, when students feel like they are part of a strength-based community, they have been shown to be more resilient when facing learning challenges and to persevere through academic adversity (Alvord & Grados, 2005).

**Create a Classroom and School Culture that Celebrates Strengths**

When you banish 'no' and 'you can't' from your classroom, and replace them with a culture of 'yes, 'you can,' and 'you are strong' instead, students notice. They begin to celebrate themselves and their peers, to encourage one another through difficulties, and to approach learning with a positive attitude.

To integrate this cultural shift, be conscious of the language that you use, and make sure that it is positively framed. Be honest about challenges, but model for students how you can use academic and social emotional strengths to persevere. Create spaces in the classroom to explore, display, and celebrate strengths; inquiry/discovery centers that are strength aligned, bulletin boards, and strength sharing times are all practices that make it clear that your classroom is a place where strengths are prized.

Talk about your students' strengths to your students, your administrators, other teachers at your school, and to the world beyond. By doing so, you will meet other strength-based educators and learners with whom you can learn and strengthen your own teaching practices. You can also teach your students to identify their strengths, a skill that will allow them to find success as learners throughout their entire lives.

In order to become an even stronger teacher yourself, resolve to identify, welcome, and build student strengths into your instruction, and go from strength to strength.

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## Tenacity and Perseverance Lead to NASA Experience

Marie Thornsberry and Wendi Rodriguez

On January 24 and 25, 2017, Wendi Rodriguez, a middle school science teacher in Phelan, CA, and Marie Thornsberry, a third grade GATE cluster teacher in Rialto, CA, took two of the most amazing flights of their lives. They flew to the stratosphere on NASA's Stratospheric Observatory for Infrared Astronomy, SOFIA. On their first flight, they had the thrill of taking off in the cockpit, alongside the pilots, experiencing a perspective so different to any other flights they had ever experienced. On the second flight, they experienced landing in the jumpseats.

The opportunity all began about seven years ago when Wendi was invited to an Open House at Armstrong Field in Palmdale. That is where she met SOFIA. Wendi toured the facilities, met with NASA personnel and learned about this great 747, its telescopes and instruments, and learned about the Airborne Astronomy Ambassador (AAA) program. During the tour, she discovered that SOFIA, from its inception, was to include educators. As then a science teacher for 21 years, she instantly knew her dream. She entered the plane, amazed by the equipment necessary for the observation, looked around, selected a seat, sat down and said, “This is MY seat!” She had set her goal. Isn't that what students are taught?  They are urged to set goals and stick to them, with the understanding that there will be obstacles, there will be challenges, but they can do it.

In 2011 the first cycle for AAA was released, Wendi applied, along with a high school colleague, and was not accepted. When the second cycle came along, Wendi invited Marie, her long-time friend, an elementary teacher in Rialto, CA, and California Association for the Gifted board member, to apply with her. To qualify, one person had to be a secondary science teacher. The partner applicant could be an educator in any field. The pair discussed the opportunity and possibilities of outreach, and how they could expand on the experiences they could provide for their students. For gifted students to “Think like an Astronomer” was one thing, but to be able to hear from their teachers who worked alongside astronomers (astrophysicists, engineers, etc), would give whole new perspectives. They decided to apply.

Unfortunately, after about six months of waiting, the disappointment arrived that the pair had not been selected. Two years later, the partners learned that another cycle opened up, but had only two days to meet the deadline. They completely rewrote their essays to include current lessons they were teaching, acquired the necessary letters and signatures to accompany their application, and submitted. In February of 2015, the pair were selected as Earth Partners. As Earth Partners, they received resources from NASA/SETI to use in the classroom, attended online meetings that included astronomy lectures, and presented to GATE elementary and middle school students and parents about SOFIA and how to view the sky. Finally, word came that they had been selected to be Cycle 4 Airborne Astronomy Ambassadors (AAA) and would fly on SOFIA. After flight dates were changed three times, the actual flight week was set for January 22-27, 2017. To prepare, Wendi and Marie had to complete a graduate level astronomy course. They discovered this to be one of the greatest challenges of their lives, especially since they were attending alongside people with backgrounds in astronomy, astrophysicists, and AP high school science teachers. This was yet another experience to share with their students, telling how they had to undergo a truly rigorous course and receive an A.

Once in Palmdale, Wendi and Marie spent a full week meeting with scientists, astronomers, astrophysicists, and engineers. They learned about SOFIA, the six different interchangeable instruments that the telescope uses, took tours of the different labs, and twice flew on SOFIA for approximately ten hours on each ride, reaching altitudes above 45,000 feet. Two of the main targets for the flights were Mars and Venus and their atmospheres, gathering data to find evidence of methane, water, possible former oceans and how quickly they evaporated. They also saw Orion, Vesta, and Messier 77, which is a spiral galaxy with a black hole in the center, as well as other celestial bodies. Seeing these targets through the infrared observatory gave the scientists more data than viewing them using visible light. The instrument EXES was used during the two flights. EXES collects information on the molecules that are in the atmosphere of the target. The presence (or lack) of certain molecules allows scientists to make predictions about the history of the target. Wendi and Marie saw evidence of ancient oceans on Venus and the lack of methane in the atmosphere on Mars.

Wendi was allowed to take two experiments that her students suggested on board SOFIA. The first experiment was an extension of a classroom challenge on which they were working. The challenge was to see which plastic water bottle would flip (rotate 360 degrees) when tossed in the air. The students determined, through a series of tests, the ideal water bottle and the exact amount of water that performed the best. The students asked their teacher to take this test on SOFIA to determine if the altitude would have any effect on the bottle toss. After reviewing the data, the students determined that the altitude did not affect the bottle toss experiment.

The other experiment students requested to take on SOFIA, was to see if the change in altitude, or direction, changed the weight of an object. To test their hypothesis, Wendi took a digital scale and a family heirloom (her mother-in-law’s high school class ring). The ring weighed exactly 16 grams when weighed on Earth. Once the flight began, she weighed the ring as the plane ascended, descended, and changed directions. The change of force on the ring would register a change of “weight” on the ring. Throughout the flight, the ring registered a weight as low as four grams and as high as 45 grams. This experiment led to a great discussion in Wendi’s class the week of her return. The fact that mass does not change, but weight is affected by forces was understood by her students.

Just as exciting as viewing the targets, was getting to know the people who work on SOFIA. They were immediately recognized as grown up gifted kids. Wendi and Marie asked several of them to share their stories of how they had arrived at where they are today. Most reported having an interest in astronomy from an early age. Some described themselves as not fitting in as young students. One spoke of sneaking out of boarding school at night to look at the stars, another told of building his own telescopes. Nearly every one though, named one special teacher who at some point in their education recognized their potential, and took time to guide them. And, that is what made the difference. They all said that in working on SOFIA, they had found their peers. They share a passion and share the same level of humor. It was evident that they are challenged by their work, but more importantly, satisfied and happy individuals.

As advocates for gifted learners, the pair saw firsthand how important it is to make sure that gifted students are placed together, are challenged by teachers who understand them, and are provided mentors in areas of their interest. Wendi and Marie observed that when this happens, it can lead to great accomplishments and satisfying lives.

**The Myth of the Math Brain**

Leslie Kapner

Are you or your child a “math person” or “not a math person?” Aren’t we born good at math or bad at math? According to Stanford professor Jo Boaler, there is no such thing as a math brain! How then, did we come to think of ourselves in these terms? Where did we catch math anxiety?

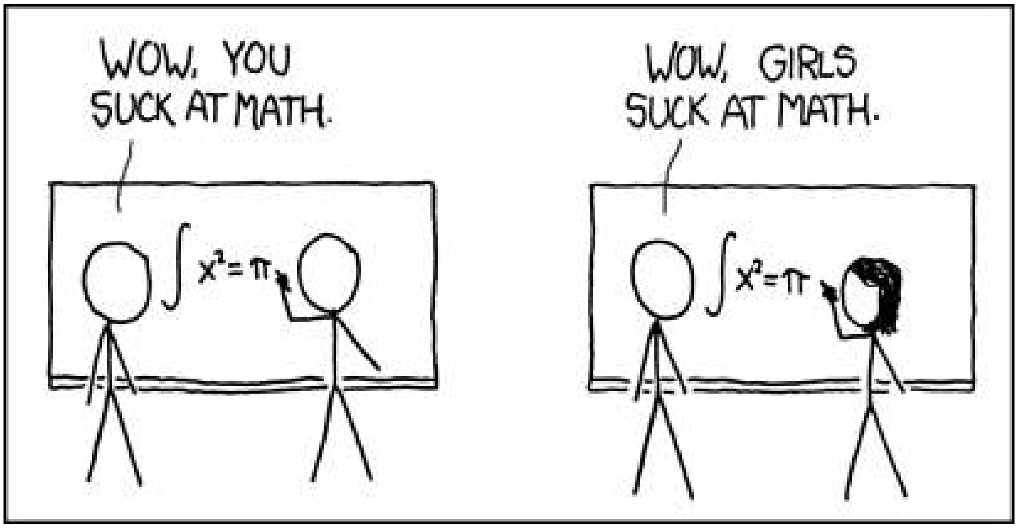
Let’s begin by defining math anxiety. Working memory allows you to keep several things in your mind at one time. These include focusing attention, manipulating information, temporarily storing information, all taking place within a few seconds. Anxiety about math, however, produces thoughts that consume valuable space in one’s working memory.

Do gifted students get math anxiety? Gifted children typically have more working memory available. When they become anxious, a greater amount of working memory is affected causing even greater anxiety for them. Sometimes when gifted students struggle with math, they conclude they are not smart after all. People who are good at math are considered “smart” in our society.

> *I think math still gives me a bit of anxiety because according to society, you’re great, smart, gifted, and beautiful if you’re a mathematician.*
>
> Mia, Teacher candidate

Relationships have a strong impact on learning, either enhancing or suppressing. The relationships in a student’s life, from parent to teacher to peers, can affect math anxiety. If a child’s mother is uneasy with math, these feelings may be passed down, especially to daughters. Children are apt to emulate their same sex parent when it comes to math. Some parents may have stereotypes about who is “supposed” to be good at math, and they may have different expectations for different children. And lastly, for our purposes, many parents believe that math is a fixed ability and cannot be improved. (*You are a “math person” or “not a math person.”*)

So, is math anxiety all the parents’ fault? Studies show that undergraduates who major in elementary math have the highest math anxiety of any major. Ninety percent of teachers are female. The more anxious teachers were about math the more likely that girls in their classrooms were to endorse negative stereotypes about female’s math ability, although boys were also affected but to a lesser degree. (Beilan et. al.)




What about the students themselves? Have you ever heard of someone bragging that they are not good at reading? Students tend to see math as a fixed ability, because unlike other subjects, math is performative, and their job is to come up with answers quickly. The feeling is either you can or cannot perform in math. Neuroscience researchers, like Carol Dweck, Camille Farmington, and David Yeager, have shown there is a strong connection between how children view themselves and how they perform academically. It even affects the way the brain approaches learning.

How can we change our students' (and our) brains/minds?  Students should know that their brains are like muscles and can shrink and grow, and that productive struggle, not anxiety, helps their brains to grow. This is called a growth mindset. People with a growth mindset believe that smartness increases with hard work. When students make a mistake in math, their brain is growing because it is struggling, even if they are not aware of the mistake. A second synapse fires if they recognize the mistake. Additionally, thinking about a problem visually lights up different brain pathways than just thinking about a problem numerically. The more pathways dedicated to a problem, the stronger the learning.

Teachers and parents must also have a growth mindset instead of a fixed mindset about math ability. Below are some tips for teachers and parents to combat the development of math anxiety.

Teachers:

- Give students time and space to work through their answers. Timed tests increase the likelihood of anxiety. Mathematicians do not rush through their work. They are actually very slow!
- Solve problems, don't "do" problems. Math is not a discrete subject or phenomenon. It is a natural everyday part of our lives. Rarely do we just "do" problems. It is very difficult to have a growth mindset when you are given short, closed questions with a right or wrong answer.
- Look for arguments vs. answers. An answer is one dimensional. An argument needs explanation and justification. Encourage students to TALK about math.
- Think carefully about how you respond to a student who is struggling. Acknowledge the struggle, praise the effort and express confidence in the ability to solve the problem.
- Researchers found a course on how to teach math concepts was more effective in addressing math anxiety among preservice teachers than a course focused directly on math concepts themselves. Tooke,D.J. & Lindstrom,L.C. (1998)

Parents:

- Encourage your children to play with puzzles and games.
- Don't tell your child they are wrong when they are working on math. Ask them to explain their thinking and find the logic in their argument and build on it.
- Don't associate math with speed. This is one of the most powerful ways to start a child on the path to anxiety.
- Never share with your children that you were not good in math!!!
- Encourage number sense (how big numbers are, how we can think about them flexibly).
- Encourage informal math literacy, like we do with language literacy with young children.

Below is an excerpt from Molly. It is from an assignment in which preservice teachers were asked to write a "math autobiography", as is Mia's above. In these few short paragraphs Molly's story moves from excitement to anxiety, as remembered 20-25 years later. Please keep Molly in mind as you work with the children in your life.

> *At first I was really excited about math. Numbers welcomed me like old friends and intrigued me like a good mystery novel. When I was very young, while most kids were adding and subtracting single digits, my dad was making math worksheets for me to do for fun at home. They often consisted of 6 digit+ addition and subtraction problems, as well as multiplication. I always begged my dad for more and more worksheets. I remember math being fun and incredibly interesting in the way that numbers made sense and were present in everything from gravity to grocery shopping. However, my excitement in math was short lived.*

*I always see this scene in black and white. I was in 4$^{th}$ grade. We were taken to a neighboring teacher's classroom, Mrs. Todd. Students chattered and laughed, but I shook nervously like a cow to slaughter. The classroom was dark. We sat at desks arranged in a circle. We "played" a game called "Around the World." One student stood behind another student, a math question (often multiplication) was asked, and the first student to answer correctly got to move on, while the other had to remain in their seat, everyone knowing their failure. Whenever my turn came close, I would start to sweat, breathing became very difficult, and thinking felt like driving through thick fog. At that point, math stopped being fun; it turned into an anxiety filled competition, where there was a winner and a loser. Even if you knew the answer, if you didn't answer fast enough, you lost. And I lost, I lost often, and that negative feeling, that dark cloud of shame that hung over our heads as we were left behind in the dust of our seats, grew into a storm of doubt and anxiety that followed me until my 1$^{st}$ year of college.*

*In 5$^{th}$ grade, the school had a brilliant idea. I could only conclude that the teachers were super villains who held top-secret meetings on the weekends and discussed how to make math an even more unbearable experience. I envisioned secret passwords, colorful costumes, and giant screens with lit up holographic pictures of students and their top weaknesses. At one of these meetings, probably, they decided to implement a negative reinforcement activity. We had daily "pop" quizzes, a page with 50 math questions, which was timed. If you couldn't answer 80% of the page correctly in the short time limit, you had to spend your recess in a supplemental math class. My problem wasn't with the material; it was with the time limit. Needless to say, I rarely saw a single recess that year.*

*These experiences made me look at math from a perspective of anger and disdain. Math didn't like me, so I didn't like math. I didn't try or put in any effort, because "why bother," "why try," I would never get it. I stopped paying attention in class and fell further and further behind.*

For further resources on how you can support your child in learning, visit this website:

**PERTS: Raising Academic Achievement**

*https://www.perts.net/*

A Stanford University center that applies research and technology to advance educational equity.

**Book Review**

Elaine Wiener

Stressed Out!
Mary Ann Richey and James W. Forgan, Ph.D
Prufrock Press Inc.
paperback, $17.95, 146pp.
ISBN-13: 978-1-61821-619-9

*Stressed Out!* has solutions to help your child manage and overcome stress.
And while people are reading this for their children, they ought to also learn about stress for themselves.

Section 1: Principals of Stress

Chapter 1: Put Stress on your Parenting Agenda
Chapter 2: Stressed, Anxious, or Both?
Chapter 3: Helpful Versus Harmful Stress
Chapter 4: Perception of Stressors
Chapter 5: Mimimize Negative Stress

Section II: Stress is Everywhere

Chapter 6: Stress in School
Chapter 7: Stress in the Community
Chapter 8: Stress in the Family

Conclusion
Resources for Parents
Resources for Kids
References
About the Authors

Mary Ann Richey and James W. Forgan, Ph.D have made this book so easy to read. Each chapter has a box with a Key Point and a Thinking Point. They provide colored paragraphs with examples of real life stories. There are tables, books, games, and activities. It is all so brief yet full of important information. You can even carry it around to use whenever a question pops into your mind.

Here are some main statements from Chapter 5, Negative stress:

1. Continue to educate yourself.
2. Educate your child but by bit.

3. Don’t forget the impact of modeling.
4. Be present for your child and really listen.
5. Be patient.
6. Be mindful of your child’s developmental age.
7. Empower your child to be a problem solver.
8. Teach self-discipline.
9. Praise and reinforce effort more than the results.
10. Lead with the Positive.
11. Have realistic expectations.
12. Provide downtime.
13. Find your child’s passions.
14. Encourage independence.
15. Help your child understand that mistakes happen.
16. Encourage your child to have a growth mindset.
17. Help your child use “positive self-talk.”
18. Predictability and structure go a long way in helping a child manage stress.
19. Remember that children have big ears.
20. Help your child learn proactive, healthy ways to handle stress.
21. Make sure you are providing healthy, nourishing meals, physical activity, and adequate sleep.
22. “Laughter is good medicine.”

It’s not that we don’t know all these wisdoms; it’s that we forget and need constant reminders. If the average child has stress, then our gifted have extra stress because they see details not seen to others. *Stressed Out!* applies them even more.

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**Book Review**

Elaine S. Wiener

Twisted True Tales from Science: Insane Inventors
Stephanie Bearce
Prufrock Press Inc.
paperback, $8.95, 150pp.
ISBN-13: 978-1-61821-570-3

Surprise! Another Stephanie Bearce book appeared unexpectedly in the mailbox. This one is called “Twisted True Tales From Science: Insane Inventors.” The “Medical Mayhem” book was worth many *Eeeoooos*…and so is this one. Our kids are going to just love knowing so many truths about science and medicine without blinking twice while we grownups are going to continue thinking “Eeeeoooo.”

Just look at the Table of Contents:

Insanely Fun

Stephanie Bearce tells us that "Modern humans take inventions for granted. They sleep on a nice comfortable mattress that isn't full of bugs and rodents because inventors in the 1800s discovered that tightly packed cotton keeps out unwanted critters."

She goes on to give many examples of inventions that were logical or even were accidents. And it is amazing that so many scientists experimented on themselves. We are told that the legend about Newton and the apple is not true. You will have to read this book to find out what the truth is!!

I enjoyed the story of Henry Cavendish who loved his books, his laboratory, and hated people!! He came from English nobility but was so shy that he even had trouble talking to his family. Cavendish experimented with chemistry, among many other things, and became the first scientist to ever isolate the element hydrogen. "His research was nearly 100 years ahead of other scientists,' but many of his discoveries were not credited to him until nearly 60 years after his death. He was so shy that he didn't want to publish his work."

*Twisted True Tales From Science: Insane Inventions* is full of true stories that most of us have never heard before. Because of Stephanie Bearce we are entertained and at the same time more educated than we have ever been. These scientists/inventors thought in ways so different from the usual. And this is a good reminder to those who work with gifted children that wonderful brains need freedom to think in original ways.

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**Book Review**

Elaine S. Wiener

Twisted True Tales from Science: Medical Mayhem
Stephanie Bearce
Prufrock Press Inc.
paperback, $8.95, 151pp.
ISBN-13: 978-1-61821-572-7

Another Stephanie Bearce book has arrived. This magazine has reviewed many of her "Top Secret Files" books which are always unique and fun…and, especially, informative. But this time, it is scary!

These books are written for kids, but they are also perfect for adults and can be read first by that adult. "Twisted True Tales from Science: Medical Mayhem" will be loved by kids because it is scary and icky and full of blood-curdling science. Grownups will say "Eeeooooo," but kids will say "Ahhhhhhhh."

In chapter one, Stephanie Bearce states that "It sounds like the scene in a horror movie, but this was medicine in prehistoric days. Sickness was a mystery. No one understood why a person was fine one day and throwing up the next….The notion that tiny organisms living in soil, air, and water could make a person sick seemed more unbelievable than the idea of evil spirits."

*Caveman Cures* talks about "trepanation" or skull drilling. (How about that for a new word?) The chapter, *Pharaoh's Fix* takes us back to Ancient Egypt with a baldness cure. We also learn about "eating dirt." And in Bearce style, we have materials for our own experiments like a heart pump!

One chapter talks about "The Black Death." This one is bad enough to make one visit the bathroom:

*They called it Black Death because of the black pustules or buboes that popped out on the victim's neck, armpits, and groin. The egg-sized tumors oozed pus and sometimes grew to the size of an apple. They were accompanied by high fever and vomiting blood. It was a horrible disease that killed 80% of the people who caught it. And in the mid 1340s, it killed more than a third of the world's population. It was bubonic plague.*

The rest of this book "oozes" facts that are just as fascinating. And Prufrock illustrates with its usual style of fascinating pictures which bleed to the edges and are always full of humor.

The Table of Contents is divided into *Ancient Days, Medieval Maladies, and Modern Marvels.* The bibliography is as gripping as the book. And although Prufrock publishes books for gifted, this book is not written specifically for gifted. However, with all the science background, "Twisted True Tales from Science: Medical Mayhem" is perfect for our science oriented gifted children.

The paragraph about Stephanie Bearce is so delightful that it is reproduced here:

"Stephanie Bearce is a writer, teacher, and science nerd. She likes teaching kids how to blow up toothpaste and dissect worms. She also loves collecting rocks and keeps a huge collection of fossilized bones in her basement. When she is not exploding experiments in her kitchen or researching strange science facts in the library, Stephanie likes to explore catacombs and museums with her husband, Darrell."

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