

Spring 5-26-2015

Creative Problem Solving: A High School Curriculum Satisfying the Needs of 21ST Century Learner

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CREATIVE PROBLEM SOLVING
A HIGH SCHOOL CURRICULUM SATISFYING THE NEEDS OF 21ST CENTURY
LEARNER

by

STEVE GUENIN

©

SYNTHESIS*
MASTER OF ARTS
CRITICAL AND CREATIVE THINKING
UNIVERSITY OF MASSACHUSETTS BOSTON

May 2015

Advisor: Professor Peter Taylor

Abstract: Designing Creative Problem Solving (CPS) – A High School Curriculum Designed to Satisfy the Needs of 21st Century Learners is my answer to the driving question: “How do teachers prepare students for an uncertain future?” Several processes influenced the curriculum design:

- 1) I reflected on the lessons I learned during my time in CCT. I looked back on the importance of having supportive instructors to accompany you on your journey. I realized practical and useful assignments motivate students to produce their best work. I gained a greater appreciation for the power of productive teams.
- 2) My growth as a stained glass artist. What I learned in this new endeavor is similar to the new experiences CPS students will have. Like me, they will realize mistakes are not disappointing failures, but valuable lessons. They will grasp the notion that excellence is a work in progress. They will understand that meaningful work is the result of practice, bold risk taking, and strong self - confidence.
- 3) My teaching and coaching experiences, informed by best practice research, lead me to include in CPS coursework building productive groups, becoming effective communicators, reigniting imaginations, and developing creative problem solving skills.

4) My call as an educator is to teach students the skills they need to be successful in all of their pursuits. Research reveals that in order for students to succeed they need the kind of skills that CPS will provide.

I wish I had learned these lessons much earlier in my teaching career, but it is exciting to have the opportunity to share what I have learned with my students now.

* The Synthesis can take a variety of forms, from a position paper to curriculum or professional development workshop to an original contribution in the creative arts or writing. The expectation is that students use their Synthesis to show how they have integrated knowledge, tools, experience, and support gained in the program so as to prepare themselves to be constructive, reflective agents of change in work, education, social movements, science, creative arts, or other endeavors.

**Creative Problem Solving
A High School Curriculum
Satisfying the Needs of 21st Century Learners**

by

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May 2015

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I. INTRODUCTORY PARAGRAPH

The final product in my critical thinking and creativity study is a document focusing on the way I plan to teach a creative problem solving course to high school students. The introduction describes what it would be like to be in my Creative Problem Solving course. Next, I step back and explain valuable lessons I have learned that I will pass on to Creative Problem Solving students. Then I lay out the Creative Problem Solving course foundation and the reasoning behind including them. Following unit descriptions I connect my efforts with others' works. I understand the initial run of CPS will not be perfect, therefore; I finish with an explanation of how I plan to learn from my first try.

II. WHAT WILL THE CREATIVE PROBLEM SOLVING CLASSROOM EXPERIENCE LOOK LIKE?

The Creative Problem Solving Course Experience

Encouragement is key to making CPS memorable, meaningful, and valuable. In CPS, affirming hard work will be continual. I will praise strong efforts openly and critique inadequate attempts privately. Publicly recognizing great efforts produces a sense of pride and leads to additional determined tries. Along with applauding admirable efforts, developing strong relationships with students will be a priority for me. I will connect with students by taking an interest in what is going on in their lives and by paying close attention to their needs and concerns. Many assignments will deal with personal issues that will provide me with more information about their backgrounds, hopes, and plans. I will congratulate profound reflections and urge students to let themselves “be known.” “They don’t care how much you know until they know how much you care.” rings loud and true.

The CPS classroom will be an environment where respect is demanded. My experiences have taught me I must earn students’ respect before they reciprocate. I will effectively model respect to warrant my students’ admiration. Respecting others’ space, property, and ideas will be supported and disrespect will not be tolerated.

CPS will be demanding. Students will be challenged daily and will look forward to the thought - provoking activities. Standards will be high. Risk - taking will encouraged and learning from failures will be commended. Assignments will require students to reach beyond their current capabilities and to strive for progress. This strategy is highly individualized, so strong teacher – student relationships will be crucial. From their CPS experiences students will form a “growth mindset” and recognize that earnestly pursuing improvement is the road to learning and earning high marks. Students will be surprised at what they can accomplish when they are pushed out of their comfort zones.

CPS will spark students’ imaginations. Rigorous questioning and discussions will be routine. Open- ended tasks will command thinking, asking, reaching, and exploring. In addition to taking care of individual responsibilities, students will work collaboratively with peers and instructors. Students will appreciate the advantages of working with others and will understand that productive group work is vital in many pursuits. Not only will students gain

from working with their peers, they will have my support. New journeys can be scary! Travelers are comforted when they have an experienced guide walking alongside them. Students will be surprised at the heights that can be reached by a dedicated team built on trust.

Throughout CPS, students will acknowledge a greater sense of purpose and will recognize their contributions as significant. I will instill a feeling of hope in my kids and convince them that they can make a positive difference if they are willing to put forth the necessary effort. I will assure them that “the juice is worth the squeeze.” Students will be shocked at how doors can open when their passions are aligned with their goals.

In addition to being encouraging, challenging, imaginative, and rewarding - CPS will be enjoyable. We will engage in a variety of activities that make learning fun. While CPS students are growing academically and personally they will be astonished at what else they have learned. They will be surprised at what they can accomplish with the right kind of encouragement. They will be amazed at how creative they can be when given the opportunity. They will be stunned at how adversity can lead to success. And they will be shocked to discover that personal reflection, while sometimes painful, is a wonderful teacher.

Along with an inviting classroom environment, CPS will provide students the opportunity to have ownership of their learning. Locating and implementing effective lessons to help students achieve their goals will be my charge. I see my role like being a treasure hunter who digs up useful lessons and brings them back to my students. This may sound optimistic, but I have learned with proper classroom management, strong student – teacher relationships, and high standards students will meet and often exceed expectations. CPS will be an exhilarating adventure for me as well. An exciting part of teaching is seeing students accomplish difficult tasks. I will be an experienced resource who guides, coaxes, and learns alongside his students on their journeys. In CPS I will not be sending students out alone. I will be riding with them.

An exciting aspect of CPS is, at its completion, students will have gotten a taste of what it is like to make a positive difference. This in turn can lead to making large - scale positive changes.

Creative Problem Solving Course Sequence

My experiences have shown me that students give their best efforts when they have ownership of their learning. Throughout the semester Creative Problem Solving students will focus on a self – chosen topic while applying useful skills they develop along the way.

CPS students will reflect on their past experiences, examine their thought processes, and envision their futures to gain a better understanding of themselves. Next, they will choose a subject they are passionate about and acquire a deep understanding of their topic. Following explorations and investigations, students will identify a problem associated with their subject and ultimately attempt to remedy the issue. Throughout the process, by means of research and a variety of supporting methods, they will develop twenty - first century learners' skills. (See Appendix A) Using this approach, students will become strongly aware of their subject while they develop desirable proficiencies. At the outset of the course I foresee students' projects being vague and unclear. Slowly their pursuits will become more polished and by the end of the semester, students will have clearly defined their inquiries and proposed thoughtful resolutions.

Rather than following a distinct unit chronology, CPS will continually refer to its themes of: 1) self - discovery, 2) developing creative confidence, 3) sharpening creative problem-solving skills, and 4) creative problem- solving steps and strategies. A greater understanding of the four themes will influence CPS students' approaches to their chosen topics.

CPS will have no single required course text, but students will read many selected works and will retrieve many of their own related pieces. I will send my messages by using numerous effective lessons and activities I have applied over the years, but I am constantly on the lookout for better techniques. Therefore; my lesson plans focus on questions to be addressed rather than instructional methods to be used. I will refer to my expansive "teacher's toolbox" to find the most useful techniques. (See Figure 1)

Figure 1 - Creative Problem Solving: Curriculum Outline

<p>Section 1: A Journey of Self - Discovery</p> <p>Topic <i>Recognizing what is important to you.</i></p>	<p>Focusing Question(s) What do you value?</p> <p>What is important to you?</p> <p>What gap would you like to fill? What problem would you like to solve?</p>	<p>Reinforcers - Toolbox Value list</p> <p>Developing a mission statement – “The Path”</p> <p>What if you won the lottery? - Do your choices reflect your values?</p> <p>Tell a story that gives your audience a glimpse of what is important to you</p>
<p>Topic <i>Understanding yourself as a creative thinker, creative learner, and creative problem solver.</i></p>	<p>Focusing Question(s) What influences your thinking processes?</p>	<p>Reinforcers - Toolbox Creativity Self – Portrait</p> <p>Creativity Self – Assessment</p> <p>Parent / Guardian Interview - “What was I like when I was a kid?”</p>
<p>Topic <i>Reflecting on the nature of creativity and creatives.</i></p>	<p>Focusing Questions(s) What does it mean to be creative?</p> <p>What are characteristics of creative individuals?</p> <p>What does your creative process reveal about you? - How can you become more creative by realizing your creative process?</p> <p>Where do your ideas come from?</p>	<p>Reinforcers - Toolbox</p> <p>Research different creativity definitions. - Find 5 different examples. - What do all of these have in common? - Come up with a definition</p> <p>Create a visual illustrating your mission statement. - Journal and reflect upon your process</p> <p>Report on a Creative _____ - Creatively report on a creative person (CCT 602)</p> <p>Interview a person in your field of interest - See interview</p>

		suggestions
<p align="center">Section 2</p> <p align="center">Developing Creative Confidence</p> <p><i>Topic</i></p> <p><i>Making Mistakes Meaningful</i></p> <p><i>Spring Boarding from Success to Success</i></p>	<p>Focusing Question(s)</p> <p>How do you develop a mindset that will enable you to become an effective creative problem solver?</p>	<p>Reinforcers - Toolbox</p> <p>Discuss neuroplasticity and its influence on creative confidence</p> <ul style="list-style-type: none"> - Vine? <p>Video – Andy Andrews – “The Butterfly Effect”</p> <ul style="list-style-type: none"> - Discuss George Washington Carver - Discuss Rubber Band Hypothesis <p>Discuss - Self – efficacy</p> <ul style="list-style-type: none"> - Learn from mistakes <p>Project – Describe something you are good at. (Something you are better at today than you were five years ago)</p> <ul style="list-style-type: none"> - Recall the steps/ it took you to get to this point <p>Produce a failure resume’</p> <ul style="list-style-type: none"> - List personal failures and what you learned from them - Follow resume’ template
<p align="center">Section 3</p> <p align="center">Sharpening Creative Problem Solving Skills</p> <p><i>Topic</i></p> <p><i>Unleashing Imaginations and Sparking a Sense of Wonder</i></p>	<p>Focusing Question(s)</p> <p>How can you reframe questions to ensure you are pursuing the real problem?</p> <p>How can you stretch yourself to consider several options?</p>	<p>Reinforcers - Toolbox</p> <p>Aquarium observations and experimental design</p>
<p><i>Topic</i></p> <p><i>Collaboration</i></p>	<p>Focusing Question(s)</p> <p>How can you work collaboratively to guarantee all group members are</p>	<p>Reinforcers - Toolbox</p> <p>Teambuilding</p> <ul style="list-style-type: none"> - ‘Either Or’ - ‘Family Feud’

	offering their best efforts?	<ul style="list-style-type: none"> - Sharing to become vulnerable Scientific method experiment
Topic Effective Communication	Focusing Question(s) How can you present your findings in a manner that best suits your purpose and your audience?	Reinforcers - Toolbox Multiple presentation types <ul style="list-style-type: none"> - Two minute speech - Diagramming data - Wordless powerpoint - 1 minute PDA - Vine - 130 character tweet - Essay - Vine - Youtube video - Snapchat
Section 4 Creative Problem Solving Steps and Strategies	Focusing Question(s) What are the creative problem solving process steps? How can you restate problems / understand the real problems? The framing of the question still gives the receiver of the question a choice, but it is a much different kind of choice and often moves the conversation forward in positive ways.	Reinforcers - Toolbox What does a creative problem solver look like? Discuss Drapeau’s problem solving steps Not “Can you finish the project by Monday?” Instead, “What would it take for you to get your project finished by Monday?”

Education Reformers

Sir Ken Robinson of Ted Talk fame is an international advisor on education. Tony Wagner is a Harvard Innovation Education Fellow. Both are well – respected in the education field. Both recognize the need for creative studies. And both are advocates for education reform. In his most recent work, Creative Schools: The Grassroots Revolution That’s Transforming Education, Robinson posed this thought; “The proper starting point (for a curriculum) is to ask what students should know and be able to do as a result of their

education.” (Robinson, 2015) He then describes eight competencies that would best satisfy today’s students’ needs. The competencies include;

“Curiosity – the ability to ask questions and explore how the world works.

Creativity – the ability to generate new ideas and to apply them in practice.

Criticism – the ability to analyze information and ideas and to form reasoned arguments and judgments.

Communication – the ability to express thoughts and feelings clearly and confidently in a range of media and forms.

Collaboration – the ability to work constructively with others.

Compassion – the ability to empathize with others and to act accordingly.

Composure – the ability to connect with the inner life of feeling and develop a sense of personal harmony and balance.

Citizenship – the ability to engage constructively with society and to participate in the processes that sustain it.” (Robinson, 2015. Pp. 135 – 140)

Like Robinson, Wagner realizes education needs an overhaul. His driving questions are: “What skills will students need to build successful careers? What skills will they need to be good citizens? And are these two education goals in conflict?” (Wagner, 2011) After interviewing hundreds of business and education leaders he came to this conclusion: “Even our ‘best’ schools are failing to prepare students for 21st - century careers and citizenship.” (Wagner, 2011)

Wagner believes students today need seven skills to give them the best chance at succeeding. He called his list the “Seven Survival Skills of 21st Century Learners” they include;

Critical Thinking and Problem Solving

Collaboration and Leadership

Agility and Adaptability

Initiative and Entrepreneurialism

Effective Oral and Written Communication

Accessing and Analyzing Information

Curiosity and Imagination (Wagner 2011)

The Creative Problem Solving course addresses educational reform concerns posed by Robinson, Wagner, and others. CPS focuses on curiosity from its outset and student learning is anchored to questioning and exploration. CPS students will recognize their boundaries and learn to operate within those parameters. In addition to generating new ideas, CPS students will bring their designs to fruition. CPS students will learn to understand an audience's needs and realize how to effectively meet those needs. CPS students will be introduced to a variety of communication techniques and be trained to confidently present their findings. CPS students will realize the benefits of collaboration, understand what it takes to build rich teams, and learn how to work constructively with others. Reflection will be a common practice in CPS. Students will reflect on past experiences as well as make intelligent predictions. Giving students a chance to be mindful will allow them to make better decisions. CPS students will notice how their work betters their personal worlds and consequently contributes to improving society.

Robinson's and Wagner's work reinforces the need for a Creative Problem Solving Course. CPS opposers might argue that many subject teachers already practice creative problem solving strategies and I agree. However, my experiences and the work of others like Robinson and Wagner reveal students are not receiving the training they need in order to succeed in today's environment.

III. WHY TEACHING CREATIVE PROBLEM SOLVING IS IMPORTANT TO ME

Touring through the Critical Thinking and Creativity Program

“Now with God’s help, I shall become myself.”

- Soren Kierkegaard

In the spring of 2011 I enrolled in UMass Boston’s Critical Thinking and Creativity program. I had taken numerous education graduate hours prior, mainly as requirements to retain my teaching license. I considered earning my master’s degree numerous times, but never found a program that interested me. UMass’ CCT curriculum offered appealing online courses. Beginning with Critical Thinking 601, I found myself with a group of like – minded students from across the globe. The instructors were interesting and thoughtful. The assignments were interesting and worthwhile. And the conversations were thought provoking. For the first time in a long while, I was excited about learning.

Originally my goal was to earn a Master’s Degree in critical thinking and creativity that would enable me to teach a Creative Problem Solving course. But my CCT work did more than satisfy educational obligations. Many classes required personal and professional reflections, practices I had not considered in years. CCT instructors challenged my thinking and the course requirements stimulated my creativity. Most importantly, my CCT experiences reinforced the idea that high school students would benefit greatly from similar creative and critical thinking encounters. Along with describing lessons I have learned as a teacher, as a parent, and as a coach, the first part of my synthesis will explain the valuable trainings CCT courses and instructors provided.

Searching for Something More

“So Russell... What do you love about music?”

“To begin with – everything.”

- from an interview with rock star Russell Hammond
in Cameron Crowe’s film, Almost Famous

I have never been a rock star – although I used to dress up like one when I was younger – and I haven’t been interviewed many times, but the Almost Famous scene makes me wonder

how I would respond if someone were to ask me, “what do you love about your teaching career?” My most complete answer would be “nearly everything.” I have taught sciences; biology, chemistry and environmental science in public high schools for the past twenty - one years. I spent the last fifteen years at Hamilton Southeastern High School, an affluent suburb north of Indianapolis, Indiana. My students are thoughtful and hard – working. HSEHS administrator encourages critical thinking and support classroom experimentation. I teach six, fifty – five minute sections of Advanced Placement Environmental Science each day. I coach one of Indiana’s most successful high school girl’s golf teams. My professional life is one many teachers dream of and one I am grateful for it. Nevertheless, I am convinced that teaching a course based on the lessons I have learned during my personal life and professional career will leave a greater lasting impression on students than teaching science does.

Recognizing Creative Problem Solving Concerns

I believe this project is worth pursuing, I do however; have some concerns. First, in order for a course to be offered in Indiana high schools it must align with an Indiana Department of Education preapproved course. Currently, the IDOE does not recognize Creative Problem Solving as an approved course. The closest one is an English class, Critical and Analytical Thinking. But, teachers can propose new courses. I do not know how that process works. A second option is appealing to the College Board’s Advanced Placement program. Currently, AP Research and AP Seminar are offered. The courses are related, but do not have the same focus as CPS. A third pursuit could be Purdue University’s Project Lead the Way. PLTW STEM courses incorporate problem solving, but not one course solely concentrates on the problem solving process. Another option is proposing CPS to colleges. Many colleges and universities offer individual creative problem solving courses and a few have CrCrTh programs. Before concerning myself with the options of where to teach CPS I will develop the curriculum as I see fit.

A second concern I have is exposing students to the volumes of interesting research about creative problems solving. I reference several pieces of work by many authors. Carol Dweck, Tina Seelig, Tom and David Kelley, Michael Gelb, Benedict Carey, Patti Drapeau and

Michael Gelb all have much to offer. But, I am not sure how to make these resources available to students.

Next, I am aware that online education is becoming more common. CPS needs to be synthesized in a manner that would still be effective if it were offered in an online format.

IV. LESSONS I HAVE LEARNED THAT I WILL PASS ALONG TO CREATIVE PROBLEM SOLVING STUDENTS

Practice Gives Rise to Confidence

When I look back at how I developed confidence as a stained glass artist, I recognize it has been a challenging journey. For many years I have admired stained glass work, especially church windows, but I never attempted to create my own glass art. About three years ago close to the same time I began my CCT course work, I decided to try my hand at constructing my own design. I checked out Stained glass basics : techniques, tools, projects by Chris Rich, then went to the local stained glass store and purchased the necessary supplies. I believed that after reading a single book and watching a few YouTube videos I would quickly become an expert. My first attempt was a disaster. My cuts were uneven and my soldering was shoddy, but I learned a valuable lesson. I would not be able to make the art I hoped for without help. I signed up for a four- week course titled “Introduction to Stained Glass” at Merry Go Round Stained Glass. With the aid of professional glass artists, my classmates and I practiced cutting glass precisely, taping pieces carefully and soldering sections accurately. For four weeks as I asked many questions and tried many techniques, my skills gradually improved. I was encouraged. We put together two pieces in the course. Both were much better than my first try, but they were still not very good. However, I understood if I put in enough time and effort I would eventually create nice work. Following the course, I made some simple pieces on my own and eventually progressed to more complicated ones. After I was satisfied with my work, I submitted three of my pieces for evaluation by members of the Hamilton County Artist Association (HCAA). The judges applauded my work and invited me to join their organization as a juried artist.

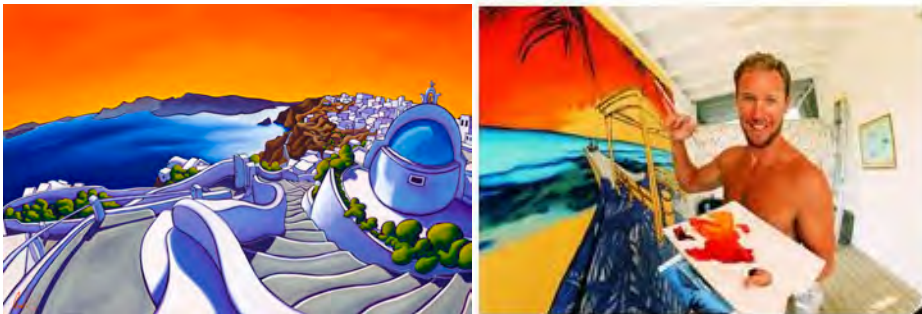
I am proud to be an HCAA member. I now enter pieces into many art shows and occasionally do commissioned work. It is rewarding to know others appreciate my art, but I realize I am far from being an accomplished artist. Now, I confidently experiment with new techniques combining different media. I realize my failures will ultimately lead to finding my artistic voice. To develop creative confidence in learners, students will be required early on in

CPS to complete confident - building simple tasks. Gradually I will ask them to finish more complicated ones.

Excellence is a Work – in – Progress

I admire many artists' work and consistently draw inspiration from them. Grant Pecoff is one of my favorite contemporary painters. (See Figure 2 – Illumination of Oia) His whimsical approach with bright colors makes me happy. I attempt to make glass projects in a similar style and invariably I am disappointed when my work does not measure up. Comparing my art to Pecoff's is treating myself unfairly. Considering only his finished products does not allow me see the hours of practice he invested into honing his craft. He has been painting for most of his life. He graduated from San Francisco's Academy of Art and all the while he has sharpened his skills. It is easy for me to imagine he has always been able to paint as well as he does today.

Figure 2 - Illumination of Oia and Grant Pecoff



Source: http://www.pecoff.com/paintings/Greece_and_Croatia

Students often fall into the same trap as I do. Regularly in my classroom, students observe a classmate performing well academically and they surmise the person is just naturally smart – they have always understood the topic. In reality, their peer has devoted hours to earning high marks. I see similar reactions in young athletes. Many teens watch LeBron James play basketball, want to play like him and get discouraged when they cannot right away. But what they do not realize is LeBron has dedicated a large portion of his life to becoming an incredible player.

In CPS, I will expose students to examples of experts who worked diligently developing their talents. This will help them recognize the kind of effort it takes to achieve mastery. Then

students will reflect on an area where they currently excel and tell the story of how they reached this point. Students might choose how they became an excellent pianist, or a fine artist, or a first – class swimmer. This assignment helps them recognize that hard work and patience led to their own proficiency.

There are several methods I will use in CPS to increase student efficacy. One approach is assigning activities that require students to reflect on their own experiences. An example of this type of lesson is, “Redesign the school week in a way that would allow you to perform at your best; support your reasoning.” Here, students are not judged by the content of their responses, but by how well they support their designs. Another confidence - building instructional method is providing students with options for assignments. An illustration of this lesson is, “Effectively communicate to your classmates the history of creativity using any approach.” Here students can present their findings in any fashion they would like. Poets can write poems. Painters can paint pictures, and musicians can write songs. My experience has shown me that students who experience academic success are more willing to attempt ambitious challenges.

Developing confidence in teenagers is a daunting task. I will constantly push students to expect more of themselves in a way that does not destroy their confidence. They will advise students to be satisfied with their progress, but help them realize there is room for improvement. There is a fine line between developing and destroying a teen’s confidence and it takes a thoughtful instructor to pull it off.

Mistakes Are Meaningful

Overcoming the fear of failure requires a ‘growth’ mindset. Students must view mistakes as stepping - stones, or as learning experiences that lead to desired outcomes rather than disappointing conclusions. My list of failures is extensive. Noted in my failure resume is a catalog of incredibly poor decisions. But, only after I reflected my lousy choices did I realize those mistakes and the lessons I have learned from them shape who I am today. I am better for having tried and failed.

One of my trying experiences occurred when three colleagues and I developed and conducted the Hamilton Southeastern Leadership Academy. We met with a group of sixty –

five nominated students weekly to discuss effective leadership, research historical leaders, devise leadership strategies and practice leadership techniques. Our theme was “We Lead Blue.” It was a wonderfully productive time for all involved. Leadership Academy kids gained a better understanding of leadership and my colleagues and I developed strong relationships with our school’s influential students. A highlight for the Leadership Academy occurred when our administration brought an unfortunate trend to our attention. The number of HSEHS students caught drinking alcohol, taking illegal drugs, or using tobacco products was increasing. At the time, the protocol was to punish the troubled kids, but unfortunately there was not much follow up. Even more disturbing was the large number of repeat offenders. They challenged our group to come up with a proactive way of dealing with the issue. That was the beginning of the HSE “Step Up” program.

After several brainstorming sessions, our group came up with the “HSE Step Up” program. It was important to us that “Step Up” supported students who were making the right choices as well as encouraged students who struggled with making poor choices. Our Leadership Academy students solicited companies in the community to donate something to support the cause. For example, our local McAlister’s Deli gave “Step Up” students a free nacho order for every \$10 they spent.

“Step Up” participants formed groups of four to eight who pledged to stay drug free for sixty days. (We determined sixty days was a challenging, but realistic length of time). Participating students received a “Step Up” card entitling them to receive benefits from local businesses. At the end of sixty days we celebrated with a gathering and kids could sign up for another sixty days in the same or a different group.

HSE “Step Up” took off. We had over four hundred students sign up for the first sixty-day segment. Leadership Academy students presented the effort to our local Chamber of Commerce, the district DARE board and the Hamilton County Drug and Alcohol Division. Student interviews were posted online and we influenced Fishers High School to form FHS STEP UP. There were plans to introduce “Step Up” to multiple schools.

“Step Up” faced many challenges including determining students’ honesty. (We relied on group accountability and the honor system). A second obstacle was deciding what to do if

someone was caught breaking his pledge. Our solution was to take his card, but allow him to be reinstated after the sixty- day cycle. There were several other issues involving what to do about students who passed their cards along to others, etc. The plan had its bugs but with much brainstorming I thought we handled the difficulties well.

Unfortunately, because of scheduling issues the next year, the HSE Leadership Academy along with HSE “Step Up” was dismantled. Hours of hard work by both staff and students and a pretty good idea failed because we did not find a way to work around scheduling issues. HSE “Step Up” is one of many failures I include on my failure resume.

Failure rears its head almost daily. Some letdowns are slight hiccups while others are nearly catastrophic. Now and again I make poor parenting decisions, some of my lesson plans fall short, I occasionally hit horrendous golf shots, and every so often my glass projects do not turn out as I had hoped. There was a time when my flops were disappointing and upsetting. Today, I believe if I am not taking risks and failing I am not trying and therefore not learning.

Understanding Your Creative Process Is Important

I shoot photos, like to paint, and occasionally draw. Lately I have been assembling a variety of stained glass projects. I admire the ornate stained glass windows in churches. Huge cathedrals and sanctuaries can be intimidating structures but the stained glass is calming. I also see stained glass as organic. Pieces change throughout the day. Morning, afternoon and evening sunrays all create their own unique effect. I did not realize why working with stained glass work appealed to me until a CCT course required me to create a piece and record my thoughts throughout the assignment. For a number of reasons I decided to design and put together a picture of Jesus emerging from the Jordan River titled “Jesus Arising.” (See Figure 3)

Figure 3 - Jesus Arising

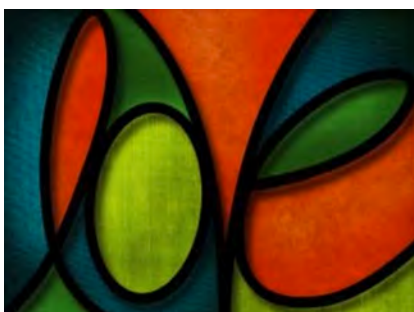


While piecing together and blogging about “Jesus Arising,” I discovered why forging stained glass art suits me (see <http://steveguenin.blogspot.com>). I like to design, I enjoy physically building things and I appreciate the challenge of making a piece I am proud of. The design stage is the most challenging for me. I first search for a meaningful image I would like to make into glass art and I draw a pattern. Secondly, I determine the colors and types of glass I would like to use (opaque versus translucent). If the piece will be hanging in a window I like to use more translucent glass compared to a piece that will be resting on an easel where I use more opaque pieces. (Opaque pieces are appealing with and without being backlit). Next, comes physically cutting and wrapping the glass. Neither task is mentally demanding but does require practice and patience. Finally, careful soldering affixes the pieces. Most of my works are detailed with many small pieces and making them is time consuming - I compare what I do to painting with glass. I enjoy seeing the work progress plus the satisfaction of making something others can enjoy.

All art forms have boundaries artists must acknowledge. Stained glass artists can only choose from a fixed number of glass colors. There are size restraints to consider, etc. I like being given a set of parameters and seeing what I can do with it. “Thinking outside the box within the box.”

Recently, I have been making glass pieces for themed shows and I really like it. Artists are given about two weeks to complete a project related to a central motif. The latest show I entered was titled “Love, Lust, and Poetry.” Artists were asked to make a Valentine’s Day piece. I made “Love Glass.” (See Figure 4)

Figure 4 - Love Glass



It is simple, but I think its simplicity makes it appealing. These short term projects also make me understand how important deadlines are in my work. If I do not have a time line imposed by someone else I work slowly. I spend too much time designing and I feel no urge to finish. Knowing my next project is due February 18 ensures I will daily spend time making progress.

It is satisfying when someone buys one of my pieces. Not only is it nice to be compensated, sometimes there are wonderful surprises. Last year, for a “Food and Drink” show I made “A Splash of Wine.” It was fun to make and I was happy with the way it turned out. The man who bought it called me and told me how he had worked at a wine bottle making factory and he had always wanted a piece of glass to hang above his wine bar. It was so nice to hear from him. I wouldn’t have thought my art would have an effect on someone like that.

Most of the pieces I make now are for shows and commissioned work, but some projects I make are experiments just to see if I can make them. The problem I run into is what do I do with these works once I have finished the, but I have found an interesting outlet. Local high school students have made a non - for profit organization called Kriya Inc. to support an eye clinic in India. Periodically they raise funds by auctioning donated art. I donated “White River Cross” (See Figure 5) to their last auction and plan to donate more pieces in the future.

Figure 5 - White River Cross



I do not know if I would have realized the meaning behind my creative process if I would not have taken the time to analyze it. I realize I thrive on artistic challenges. I enjoy experimenting. And making something meaningful for someone is rewarding.

V. FOUNDATIONS OF THE CREATIVE PROBLEM SOLVING CURRICULUM

A question I frequently ask myself is “How can I best prepare my students for life after Hamilton Southeastern High School?” My most useful answer is to provide them with the skills that will allow them to boldly face any challenge. Champion of educational reform, Tony Wagner, identified these 21st Century skills that must be taught if students are to meet future challenges: critical thinking and problem solving, collaboration across networks and leading by influence, agility and adaptability, initiative and entrepreneurship, effective oral and written communication, accessing and analyzing information, and curiosity and imagination. (The Other 21st Century Skills: Educator Self-Assessment. 2015) (Appendix 1) Each of these 21st century skills will be addressed throughout CPS, but before students can benefit from any of them they must be sure of themselves.

Developing Creative Confidence in Uncertain Students

Instilling creative confidence in students is vital when molding effective problem solvers. CPS instructors have many complicated responsibilities. They will urge students to attempt increasingly difficult tasks. They will encourage students to see their failures as necessary means to achieving goals. They will provide students with opportunities to succeed academically. I am convinced when all of these targets are met, students will not only be strong problem - solvers but their new - found confidence will carry over into all areas of their lives.

In my experience with students I recognize they have numerous fears: being judged, making mistakes, being criticized, being alone, getting started, finishing, the unknown, disappointing others, change, freedom, leaving home, staying home, public speaking, spiders, death of a loved one, dying, not getting into the right school. In my opinion, however, what hampers creativity and achievement is the fear of failure.

The challenge is - how does an instructor foster creative confidence in students who face a mountain of fears? Creative Problem Solving will build student confidence by exercising two approaches. First, CPS students will learn to regard failures as stepping stones towards

success rather than interpreting letdowns as disappointing outcomes. Second, CPS students will gain confidence by experiencing incremental successes.

Reflecting Productively

Self – reflection leads to improvement and guided discovery. Prior to my time in CCT, my reflections consisted of; wondering if my lesson plans enabled my students to understand content and questioning if my golf practices made my players better. These observations led me to continually upgrade ineffective lessons and tweak unsuccessful practice plans. But, CCT taught me self – reflection is about much more than professional progress; it is about realizing dreams. Throughout my course work I considered the following questions; ultimately what is it I want to accomplish personally and professionally, what drives me, what gives me satisfaction, and does my life echo what I deem important. With me alongside them, CPS students will ponder their personal ambitions and possible paths.

My purpose, as a child of God, a husband, a father, a teacher and as a coach is helping others achieve their dreams and meet their goals. Teaching science gives me the opportunity to positively impact hundreds of students each year. But, the majority of my time is spent covering a standards based curriculum. Teaching CPS will give me a chance to help students determine what is important to them, guide them down a positive path, and give them skills necessary to make positive changes. In addition to becoming creative problem solvers, CPS students will experience personal discovery.

Challenges drive me. I have taught well and coached successfully for a number of years. My students have accomplished incredible feats. My golf teams have earned the highest honors. I am ready for a new challenge. Developing and teaching CPS will provide the new challenge I am searching for. I will produce meaningful lessons, develop deeper relationships with my students and provide life lessons while teaching 21st century learning skills.

Pouring into others, overcoming obstacles and creating satisfies me. My reflections reminded me of numerous satisfying aspects of teaching. I love interacting with energetic kids. I love creating exciting helpful lesson plans. I love seeing students' faces light up when a question is solved – I love even more the struggle problem solving requires. I love seeing

other's hard work pay off. I love seeing a student overcome a hurdle. I love the 5:00 am call announcing a two – hour delay; a school closing announcement is even better. I love spring break and summer vacation. I love having a decent paying job that enables me to spend time with my family. I love the fall golf season. I love that I have influenced thousands of teens. I love that I get to try new methods every year, sometimes I try new ones in the same day. I love that I get to start with a clean slate each fall. (I view the last twenty years as practice). I love hearing from former students who are happy with what they have become. Teaching suits me on a number of levels. Teaching CPS will give me a greater chance to positively influence students.

Imagining Actively

To prepare students for an uncertain future, CPS will require them to rely on their imaginations. Because imaginative thinking leads to discovery, the process builds a stronger connection between the learner and the material. A popular effective teaching technique is “Genius Hour.” Inspired by Google and 3M practices, “Genius Hour” is delegated time when employees are encouraged to experiment with and learn about something they are passionate about. The rationale behind the “Genius Hour” is it keeps workers enthusiastic and often leads to innovations for their own company. “Genius Hour” learning gives students opportunities to immerse themselves in a subject of their choice. In depth research followed up with presentations gives students ownership of their learning, encourages imaginative thinking, and sharpens academic skills. In the first week of my AP Environmental Science course, students engage in a “Genius Hour” project of sorts. I fill a number of aquariums with pond water, the scum at the bottom of the pond, and all the included macroinvertebrates. Initially, students must generate a list of twenty observations about their tank. Next, students must come up with ten questions about their tank that they could possibly answer with further investigation. Thirdly, students must narrow their ten questions down to one they would like to explore. Then, using the scientific method, they have seven to ten class periods to develop a research question, explore their topic, develop a hypothesis, devise an experiment to test their hypothesis, carry out the experiment, record their results, and form a conclusion.

There are some parameters to consider. First, the time limit for completion is ten class periods. Second, we never kill or try to kill any organisms purposefully. Third, students may not do anything that affects the entire tank (tank water samples are permitted for chemical experimenting). I encourage them to tackle complex questions, but ones they are interested in. Historically, this has been a successful project. I find it valuable for a number of reasons. Students are stretched to make twenty observations. They must practice divergent and convergent thinking. They must spend their time wisely. They understand immediately that my class is different from most in that I expect them to think critically, keep careful records, and take pride in their work. One of the most impressive questions was “How can you quantify the macroinvertebrate diversity of the tank?” She used Simpson’s biodiversity index for her calculations.

In AP environmental science we hone our imaginative skills in other ways as well. One of my most effective “Imagine if...” lessons encourage students to picture a world of their own. In our “Global Climate Change” unit students watch scenes from Ben Stiller’s movie, *The Secret Life of Walter Mitty*. We pay particular attention to Walter’s visit to Iceland. Following the movie students choose a foreign country they are interested in. Then they must develop ten relevant questions concerning life in their country and research the answers to their questions. Next they are required to describe the possible effects of global climate change on them as a citizen of their country, and finally, generate a possible precautionary strategy. Students present their findings to the class using ten wordless power point slides and are assessed by the quality of their presentations. I have done “Imagine if...” projects for two years and both times students did wonderful work. Last year, a student interviewed a Chilean woman over the phone to gain relevant information. (maybe this should be a requirement?). “Imagine if...” gives students ownership of their learning. It also requires students to gain knowledge, make connections, manufacture predictions, and exhibit empathy. CPS will include projects like one based on *The Secret Life of Walter Mitty* to stimulate students’ imaginations.

My experiences have shown me that students all have imaginations. Unfortunately, they are rarely given the opportunity to use or develop their innate ability. CPS will be a space where students are called to solve real world problems, will acquire and apply in depth

knowledge, are encouraged to take calculated risks, and are motivated by their personal interests.

Collaborating Dynamically

I have been a part of many teams as a player, as a student, and as a coach. The most successful ones were groups who trusted one another, put their differences aside, and strove to achieve a common goal. My high school baseball and football teams were memorable groups. Traveling cross - country and competing with my softball team is a highlight of my adult life. On the other hand, I have endured miserable seasons with groups of girls who refused to buy into the team concept. Today I work collaboratively with professional colleagues to produce meaningful lessons, my coaching staff and I develop beneficial practice plans together, and I work alongside CCT buddy partners and instructors who push me to produce my best work. I have seen the heights cohesive teams can reach and I want my students and players to experience the same triumphs.

My collaborative experiences led me to develop this series of beliefs:

- I believe strong teams can accomplish more than individuals can achieve.
- I believe people want to be a part of something.
- I believe everyone has something to contribute.
- I believe accomplishing something with others you could not accomplish alone is rewarding.
- I believe students wish to be a part of something bigger than themselves.
- I believe people will have to work with others more often than they will work alone.
- I believe being able to get along with others is a necessary skill worth developing.

Because I believe in the power of teamwork and collaboration I work hard at developing it in my players and my students. The foundation of strong teams is trust. Trust building is a delicate process, but one that must be addressed. I work diligently with my girl golfers to build the necessary trust. We talk often. Throughout the season, we discuss our favorite foods and restaurants, our best vacations, our most embarrassing and proudest moments, our unique characteristics, our expectations, our goals, and our dreams and fears. Sharing allows us to discover things about ourselves and each other. In addition to talking with each other; we play

games, we go on outdoor adventures, we watch movies, we eat meals, we serve the community, we support our junior high teams, we set challenging but attainable goals, and we hold each other accountable. Our experiences form wonderful memories, build trust and they help make every one of my twenty of my golfers realize they are all important contributors to our team.

I require my students to work collaboratively often. Unfortunately, many students have undergone bad teamwork experiences and dread participating. High achievers end up doing all of their group's work to ensure high quality. Low achievers, on the other hand, appreciate group work because they rely on others to pick up their slack. I approach group work issues early each semester in much the same way as I do with my golfers. We build trust. I first divide classes into groups of three or four (this creates a different dynamic than student chosen groups). Next, I have each group brainstorm twenty negative aspects of teamwork. Following the brainstorm, each group narrows down their large list into the single worst feature of teamwork. A popular choice is "not everyone contributes." We brainstorm again to determine how to ensure everyone will contribute. We repeat the process for the positives about teamwork. Teamwork brainstorming begins the team building progression.

After sharing opinions about teamwork we play games to strengthen bonds. In "Either Or" students choose their favorite from two options like "sunrise or sunset" or "text or talk" or "chocolate or vanilla." After choosing, students compare their results with the rest of their group members to determine the number of similar answers. This simple activity helps students realize what they have in common with their teammates. Finding commonalities with others brings them closer. After "Either Or", we play "Family Feud." Each group is now a family competing against the other families. "The Feud" is a fun and exciting opportunity for groups to achieve a shared goal. Following the games, groups share their most memorable school activities with each other. I believe groups should not work together until members know each other.

Our first group project is a scientific method review called "Ant Pitfall Traps." In "Pitfall Traps" groups use the scientific method to determine what food products will attract the most ants in twenty – four hours. During "Pitfall Traps" groups arrive at decisions together, issue

individual responsibilities, hold one another accountable, and turn in one collaborative effort. At the conclusion of “Pitfall Traps” each student completes an “Anatomy of a Lesson” survey. “Anatomy of a Lesson” is a review of the lesson when individuals comment on the positives and negatives, offer possible improvements, and respond to a series of questions about their own contributions as well as their group members’. I assign an “Anatomy of a Lesson” for subsequent group works.

Building productive teams can be difficult, but the results can be beyond belief for both students and instructors. I believe after many attempts students understand the value of working cooperatively and grasp the importance of being a contributing member. Collaboration creates a strong force on the playing field. It leads to impressive classroom work. And is one of the most sought after skills in the workplace.

Communicating Effectively

Effective communication is an essential skill for 21st century problem solvers. Becoming a first-rate communicator is difficult. With dedicated practice and repetition, however, students (even the glossophobic) can learn to competently share their thoughts and findings. Therefore, I require my students to express themselves often using a variety of methods. I believe the key to proficient communication is clearly conveying your message to the audience. Whether the presentation method is reading an essay, delivering a speech, producing a video, reciting a poem, showing a photo, displaying a piece of art, or participating in a mock interview, a presenter’s objectives are to inform and connect with their listeners.

To make public communicating less frightening for teenagers, I break down the process with a series of questions.

1. What is the message you are sending?
2. Why is your message valuable?
3. Who is your audience and what do they need from you?
4. How will you connect with your audience?
5. What format will convey your message well?
6. How do you know if your audience understood your intended message?

A human population lesson I enjoy and consider beneficial is “A Portrait of HSE.” The prompt is, “Michael and Meredith are twins moving to Indiana from out of state. They have to choose one of three high schools to attend; Carmel High School, Noblesville High School or Hamilton Southeastern High School. All three institutions have strong academic, athletic, and extracurricular programs and are similar in size. The determining factor for Michael and Meredith is the student body composition. Your group’s assignment is 1) to ask twenty Southeastern students three questions that will provide an intimate description of the HSEHS student body; 2) to explain the rationale for those three questions; 3) to effectively present your findings to the class.”

I find this assignment valuable for a number of reasons. First, it requires students to think divergently and convergently. Groups begin by brainstorming possible enlightening questions and then narrowing down their choices to the three most useful ones. I am often surprised at the wide range of questions the groups choose. Examples are: what do you do on the weekends, what three words would your friends use to describe you, what would you do to make a new student feel welcome, what is one word that defines HSE students, and what is the best thing about HSEHS?

Next, groups have to determine the best way to share their findings. “A Portrait of a High School” lends itself to several presentation options. Some groups make posters illustrating the data they collected. Others created power point presentations with informative slides. Student interviews, vines, and Instagram posts are also used. Combined with some public speaking standards, the rubric refers to the six public communication questions we have considered.

My students’ presentation skills are wide ranging. Some come into class as polished speakers, but most are shaky and nervous. Each year I see their public communication skills improve. They become more confident and leave my class better prepared to meet the needs of future audiences.

Solving Problems Creatively

After researching numerous definitions of creativity, I found that it includes “a newness or originality” and “worth or significance.” For this piece and course I am going to view

creativity as an original idea that has value. The next point to reflect on is, what is a problem? Like the creativity definition, the definition of problem takes many forms. Problems are not arena specific and are encountered throughout life. In Creative Problem Solving, problem will be defined as the gap between the current condition and the desired condition.

Problem solving is the basis for much of my AP Environmental Science curriculum. Often I challenge all students to solve the same problem. Other times I require each student to develop his or her own problem. Both are effective, but require different approaches. One of my favorite “solve the problem” activities is “How Can We Clean Up Geist?” Hamilton Southeastern High School is less than one mile from Geist Reservoir. The reservoir provides fresh drinking water to much of the Fishers population and on its shores are some of the most luxurious homes in the community. Unfortunately, for many reasons, the water is terribly polluted. Every year there are reports of oil slicks, algal blooms and zebra mussel infestation.

In “Clean Up Geist” individuals must first research the pollution issues, narrow their search down to one topic they would like to approach, and provide a rationale for their choice. Second, students must investigate the causes and effects of their pollution problem. Following their inquiry, students propose a possible creative solution to their challenge. Finally, students determine a possible hindrance their solution would face.

Historically, the biggest obstacle students face in “Clean Up Geist” is coming up with an original response. For example, most who choose to fight Geist’s spring algal blooms realize fertilizer runoff is the main culprit. They focus their plan on fertilizer substitutes. After I encourage them to think imaginatively, more creative possibilities come to light. For example, one student required all homeowners to sow native Indiana nitrogen - absorbing plants at the edge of their lawns. She realized many residents would be opposed to this, so she designed a pamphlet for them to explain the benefits of her proposal.

A main component in Creative Problem Solving will be for students to creatively solve a problem they are passionate about. Along the way, students will consider their personal past and current situations, and will project what their future may bring. They will engage in activities requiring them think imaginatively as individuals and contribute as group members. They will determine how to convey their findings effectively and recognize likely obstacles.

VI. WHAT HAVE OTHERS SAID ABOUT DEVELOPING 21ST CENTURY LEARNING SKILLS?

My goal as an educator is to provide students with the skills they need in order to succeed inside and outside the classroom. Numerous educators, behavior scientists, psychologists, coaches and colleagues influence my teaching approach and delivery methods. I borrow their helpful ideas now and will continue referring to them in CPS. I expect the CPS content to remain fairly constant from year to year, but adopting new best practice methods to meet the needs of my 21st century learners will be routine. (See Appendix A) Recently British Education Reformer, Sir Ken Robinson noted, “Imagination is the source of every form of human achievement. And it's the one thing that I believe we are systematically jeopardizing in the way we educate our children and ourselves.” Not only is it important for me to activate my students’ imaginations, I need to keep imagining a better classroom experience and act on my impulses. Learning about student motivation and development, post high school expectations, and innovative teaching techniques excite me. The following is a sample of what some professionals have to say about educational creativity and achievement.

In their publication, “The Mission of the High School,” Paul E. Barton and Richard J. Coley defined a high school’s mission as “preparation of students for college, careers ... and to be life - long learners.” (Barton and Coley, 2011) University of Southern California author and professor, John Warner, wrote “Success at the University level does not call merely for mastery of content.” He believes the following traits are most important to success in college and life:

- *Curiosity – students with this trait “will learn things simply because they want to know”*

CPS is geared toward developing curiosity. CPS students will be required to compose their own questions. My experiences have shown when students have a say in their learning they put forth greater effort.

- *Self – regulation – “many students are not used to managing their own time and freedom”*

Producing work in a timely manner is key to creative endeavors. CPS students will experience working with deadlines.

- *Passion – “it doesn’t matter what the passion is, and it need not be academic. Students need to care about something in order to care about school.”*

CPS will investigate metacognition, influences on students' thinking processes.

This exploration uncovers passions.

- *Empathy – “students must be able to see from another’s point of view. Part of the learning process is gaining a new perspective.”*

A CPS beauty is at the same time many different students will be striving to solve the same problem. Participants will recognize and appreciate others' approaches.

- *Courage and skepticism – “students must be willing to ask tough questions, ‘stick their noses into a discussion and believe they can contribute.’”*

Students who are effective problem solvers need in depth topic understanding. My experiences have revealed that knowledge increases confidence. In addition to bolstering their academic skills, CPS students will develop the life skills needed for college success.

Developing Creative Confidence

Making Mistakes Meaningful

“Whatever humans have learned had to be learned as a consequence only of trial and error experience. Humans have learned only through mistakes.”

- *American Philosopher*

Buckminster Fuller

How do you develop creative confidence in students?

In my experience with students I recognize they have numerous fears: being judged, making mistakes, being criticized, being alone, getting started, finishing, the unknown, disappointing others, change, freedom, leaving home, staying home, public speaking, spiders, death of a loved one, dying, not getting into the right school. In my opinion, however, what hampers creativity and achievement is the fear of failure.

Tom Kelley wrote in his book, [Creative Confidence](#);

Fear of failure holds us back from learning all sorts of new skills, from taking on risks, and from tackling challenges. Creative confidence asks that we overcome that fear. You know you are going to drop the ball, make mistakes, and go in a wrong direction or two. But you come to accept that it's part of learning. And in doing so, you are able to remain confident that you are moving forward despite the setbacks. (Kelley, 2013. pp. 44 – 45)

The challenge is - how does an instructor foster creative confidence in students who face a mountain of fears? Creative Problem Solving will build student confidence by exercising two approaches. First, CPS students will learn to regard failures as stepping stones towards success rather than interpreting letdowns as disappointing outcomes. Second, CPS students will gain confidence by experiencing incremental successes.

I find Daniel Coyle's research about developing expertise captivating. Coyle is a contributing writer for *Outside Magazine* and *New York Magazine*. When asked, "What is it you do?" he answered, "I look at people who are very good at what they do and try to figure out why." This intrigues me as a teacher and coach because I want to know how to make my students and players very good at what they do. His bestselling book, "The Talent Code" is an account of his findings.

Coyle spent nearly two years visiting "talent hotbeds" - little places that turn out impossible numbers of high achievers. Spartak is a one-court Russian tennis academy that produces more top twenty women tennis players than the entire United States. Meadowmount is a classical music camp in the Adirondacks where attendees learn a year's worth of material in seven weeks. Meadowmount graduates include Yo-Yo Ma, Joshua Bell, Itzhak Perlman, and Pinchas Zuckerman. Other hotbeds include the Septien Entertainment Group in Dallas; Pabao Little League in Willemstad, Curacao; and The Z – Boys Skateboarders from Los Angeles. (Coyle 2009)

Coyle discovered all hot beds share three common threads.

- Each utilized a form of deep practice filled with mistakes and repetition
 - Every place was filled with images of the people they want to become
 - All were run by knowledgeable coaches who knew how to relate to students
- (Coyle 2009)

Here is how I understand "deep practice." It requires participants to operate at the edge of their abilities. Deep practice instructors drive students to reach beyond their capabilities, make mistakes, fix the mistakes, then repeat the process until they get it right. Deep practice pupils recognize mistakes are necessary for improvement. For example, Meadowmount cellists are given a small section of an incredibly difficult piece of music.

Musicians play the piece very slowly making sure each stroke and each finger placement is perfect. This technique is repeated again and again until the piece is played perfectly. Only then are they given another section. Coyle stated, “Most people have an allergic reaction to mistakes, it makes them feel crappy. These kids saw mistakes as a piece of information they can use to move on.” (Coyle 2009)

Coyle’s deep practice is likened to K. Anders Ericsson’s deliberate practice. Deliberate practice is defined as “a highly structured activity engaged in with the specific goal of improving performance.” (Ericsson 1993) According to Ericsson, the four essential components of deliberate practice include:

1. You must be motivated to attend to the task and exert effort to improve your performance.
2. The design of the task should take into account your pre – existing knowledge so that the task can be correctly understood after a brief period of instruction.
3. You should receive immediate informative feedback and knowledge of results of your performance.
4. You should repeatedly perform the same or similar tasks. (Ericsson 1993)

Coyle and Ericsson agree. In order to enhance performance, participants must stretch themselves beyond their current capabilities and recognize their deficiencies as essential feedback. Deliberate practice is difficult and not much fun. This is why not many engage in it. (Ericsson 1993) CPS educators will convince students, “the juice is worth the squeeze.”

Deep practice has resulted in expertise in many fields, but does this technique translate into gaining confidence in problem solving skills? I believe it does. The American Psychological Association (APA) reported in its installment “Practice for Knowledge Acquisition (Not Drill and Kill)”

Practice is important for teaching and learning in at least five ways:

1. Practice greatly increases the likelihood that students will permanently remember new information that they encounter by transferring it into their knowledge base.
2. Practice increases student facility or automaticity (automaticity means learning to apply elements of knowledge automatically, without reflection). Automaticity is usually only achieved through extensive rehearsal and repetition. Automaticity frees up students' cognitive resources to handle more challenging tasks.
3. When students practice solving problems, it appears that they increase their ability

- to transfer practiced skills to new and more complex problems. (Glover, Ronning, & Bruning, 1990)
4. Practice helps students acquire expertise in subject matter and therefore helps to distinguish novices from experts in given subjects.
 5. Cognitive gains from practice often bring about motivation for more learning. (Glover, Ronning, & Bruning, 1990).

The APA expanded on the role of practice with, “Teachers should think of practice not as rote repetition, but as deliberate, goal-directed rehearsal paired with reflection on problem-solving processes. That is, teachers should always design practice activities with the goal of transferring knowledge to new and more complex problems in mind.” (Glover, Ronning, and Bruning, 1990)

In order for CPS instructors to develop in their students a mindset that recognizes mistakes as stepping stones to a desired outcome, instructors will expect/ require students to continually stretch themselves beyond their current abilities. The CPS instructors will provide feedback describing what students can do to improve.

Self - Efficacy

Decades ago, Stanford psychology professor Albert Bandura focused his efforts on curing ophiophobiacs of their debilitating fear of snakes. By encouraging his subjects to take small incremental steps, patients who once could not be in the same room with a snake eventually held one. Tom Kelly described the experience like this:

First, he tells phobic people that there is a snake in the room next door and that they are going in there... Next, he leads them through a long sequence of challenges, tailoring each subsequent step to be just within reach. For example, at one point, he has them look through a one – way mirror at a man holding the snake and asks, “What do you think that thing will do?” People with phobias are convinced the snake will wrap itself around the man’s neck and choke him. But contrary to their beliefs, the snake just dangles lazily without choking or constricting at all... And so it continues. Further along, Bandura asks them to stand at the open door of the room with the snake inside. If the step is too scary, he offers to stand with them at the door... Many small steps later, eventually they are right there next to the snake. By the end of the session, people touch the snake. And just like that, their phobia is gone. (Kelley 2013. p.38)

Bandura later applied the techniques used to cure ophiophobiacs to promote personal accomplishment. Much like taking baby steps to overcome a fear of snakes, he found conquering doubts in one's creative ability can be accomplished by guiding people through a series of small successes. The experience can have a powerful effect on the rest of their lives, as well. Bandura's work revealed that

There is evidence that self-efficacious students participate more readily, work harder, persist longer, and have fewer adverse emotional reactions when they encounter difficulties than do those who doubt their capabilities. In terms of choice of activities, self-efficacious students undertake difficult and challenging tasks more readily than do inefficacious students. (Bandura, 1997)

A method CPS instructors will use to increase student efficacy is assigning activities that have no wrong answers. A sample assignment is "redesign the school week in a way that would allow you to perform at your best." As long as a student can support his response there is no wrong design. Another confidence building instructional method is providing students with options for assignments. For example, when students are required to report on the history of creativity they can present their findings in whatever form they are comfortable with. Poets can write poems. Painters can paint pictures. Musicians can write songs etc. My experience has shown me students who experience academic success are increasingly willing to attempt more ambitious challenges.

In this excerpt the Kelleys relate Bandura's self – efficacy in creative confidence terms; The state of mind Bandura calls self – efficacy is closely related to what we think of as creative confidence. People who have creative confidence make better choices, set off more easily in new directions, and are better able to find solutions to seemingly intractable problems. They see new possibilities and collaborate with others to improve the situations around them. And they approach challenges with newfound courage. (Kelley and Kelley. 2013. p. 40)

Del Siegle wrote in his Self – Efficacy Intervention; "The connection between self-efficacy and achievement gets stronger as students advance through school... If we wish to develop high educational achievement among our students, it is essential that we begin building stronger self-efficacy as early as possible...Research over the past 25 years indicates strategies do exist to increase students' confidence." (Siegle, 2000)

Instilling creative confidence in students is vital when molding effective problem solvers. CPS instructors have many complicated responsibilities. They will urge students to attempt increasingly difficult tasks. They will encourage students to see their failures as necessary means to achieving goals. They will provide students with opportunities to succeed academically. I am convinced when all of these targets are met, students will not only be strong problem solvers but their new- found confidence will carry over into all areas of their lives.

How Do You Spark Imaginations?

“Every child is an artist.
The problem is how to remain an artist once we grow up.”
- *Artist*
Pablo Picasso

Imagining how to present information in the form of a story leads to effective oral and written communication. Imagining a brighter future inspires hope. Imagining possibilities leads to arousing initiatives. Imagining unconventional collaborations leads to creative combinations. Educational theorists Kieran Egan and Dr. Rudolf Steiner pose, “imagination is the basis of all human development, and that therefore its role in education is vital if human potential is to be nurtured for individual and the collective good.” (van Alphen, 2011) Educators are often asked, “How do you prepare students for jobs that do not yet exist?” My best answer is to provide them the skills that will allow them to boldly face any challenge. To better prepare students for an uncertain future, CPS will require students to rely on their imaginations.

General systems scientist George Land wrote, “**What we have concluded is that non-creative behavior is learned.**” This is an interesting premise based on the idea that students are born imaginative and need only to be retaught how to use their imaginations when they are older. In the early 1968 NASA had Land develop a creativity assessment to determine which scientists should work on their most difficult problems. The test proved highly effective. NASA identified their most creative problem- solvers and put them to work. Following his NASA success, almost on a whim, Land administered the same test to sixteen hundred three to five-

year- olds. He retested the same children when they were ten and again when they were fifteen. The results were astounding:

98% of five- year- olds passed the test at the genius level for divergent thinking

30% of ten- year- olds passed at the genius level

12% of fifteen- year- olds passed at the genius level.

*Out of curiosity Land tested two hundred eighty thousand adults and only 2% qualified as geniuses.

(Land and Jarman. 1993)

Mind you, these were the same children, only older. Land's test results make me wonder about what has happened to children's creativity? At the same time, knowing most children have creativity within them is encouraging. CPS will dare each student to awaken the imaginative child within him in hopes of boosting his skills as a problem-solver.

An added bonus of using imagination is that the process builds a stronger connection between the learner and the material. Educational author M.T. Milora described the idea of imagination as "the link between emotional and intellectual thinking: the images we imagine are created from the connection between what we feel and what we think, and aid in developing deeper understanding." (Drapeau, 2014, p. 59)

Steiner and Egan maintain,

...for children to be motivated to learn, they need to connect with the subject material by means of the imagination... when teachers appeal to the imagination in their lessons, learners become engrossed in the subject matter and willingly participate in a learning process...These experiences stimulate creativity in thinking and involve the emotions of the learners, through which a more meaningful relationship is established with the learning material.

(van Alphen, 2011)

Tina Seelig, author of Genius: A Crash Course on Creativity, lists challenge, knowledge, environmental conditions, and motivation as the four conditions necessary for imagination to flourish.

Challenges, especially real – world challenges, invite students to use their imagination to extend thinking about what is known in order to solve real problems. By noticing, embracing, and questioning content, students begin to imagine possibilities.

Knowledge – our storehouse of experience and information – is “the raw material of imagination” says Tim Berra. Knowledge is affected by memory: in order to be able to access knowledge, students must remember information. There are two types of imagination, reproductive and productive. Memory is affected by reproductive imagination. (Seelig, 2009 p. 61)

Knowledge is an important factor in productive imagination, which involves the formation of concepts. Students form concepts based upon their ability to process knowledge by making connections and identifying patterns. Productive imagination allows students to create products to show what they know.

Environment – fosters imagination and also pushes the status quo; the environment allows a safe place for risk taking, which means being able to accept failure. In order to make risk taking comfortable for students, teachers talk about the benefits of trying, making mistakes, and failing.

One way to encourage safe risk taking is to provide only feedback, with no grade.

Motivation – “the drive to do something because it is interesting, challenging, and absorbing... is essential for high levels of creativity” (Pink, 2009, Chapter 2).

To motivate students in the creative classroom:

- Provide students with the right level of challenge
- Ensure students have the appropriate tools and learning skills, such as note taking, memory techniques, and comprehension and problem solving strategies
- Encourage effort
- Connect with students personally
- Give students or allow students to discover a reason why they want to learn the content
- Provide students with feedback and data about their progress and
- Let students progress at their own pace (Seelig, 2009 p. 64)

My experiences have shown me that students all have imaginations. Unfortunately, they are rarely given the opportunity to use or develop their innate ability. CPS will be a space where students are called to solve real world problems, are encouraged to take calculated risks, are motivated by their personal interests, and will acquire and apply in-depth knowledge.

VII. HOW HAVE OTHERS APPROACHED CREATIVE PROBLEM SOLVING?

Defining Creative Problem Solving

“The creative person wants to be a know-it-all.
They want to know about all kinds of things:
ancient history, nineteenth century mathematics,
current manufacturing techniques, flower arrangements, and hog futures –
Because they never know when these ideas might come together to form a new idea.
It may happen six minutes later or six months or six years down the road.
But they have faith it will happen.”
- American advertising executive
Carl Ally

The first question to consider is: What is creative problem solving? At first glance creative problem solving seems to have a simple description. That is not the case, however. The definition of creativity or creative takes many forms that include:

“The ability to make new things or think of new ideas”
– Merriam Webster dictionary

“The tendency to generate or recognize ideas, alternatives, or possibilities that may be useful in solving problems, communicating with others, and entertaining ourselves and others”
- Robert E. Franken, Author, “Human Motivation”

“Any act, idea, or product that changes an existing domain, or that transforms an existing domain into a new one”
- Mihaly Csikszentmihalyi, Hungarian Psychology Professor

“Bringing something into being that didn’t exist before or reshaping something that already exists into a new form.”
- Julia McCutchen, Creative Life Coach

Educational consultant and author Patti Drapeau, wrote, “A problem exists when there is a discrepancy between what exists and the desired situation.” I appreciate this explanation because it can be applied to any situation and to both individuals and groups. Psychologist R.B. Noller stated it this way, “By problem we mean: any situation which presents a challenge, offers an opportunity, or is a concern.” I like this description because it views all problems as challenges and opportunities. I believe students are driven to overcome challenges. Wright

State University's Scott Williams penned, "Creative problem solving involves a hunt for new solutions, while routine problem solving uses old solutions (*borrrring!*).” A “hunt” sounds adventurous. Students love adventures. The Creative Education Foundation posted, “Creative Problem Solving is a proven method for approaching a problem or a challenge in an imaginative and innovative way. It’s a tool that helps people re-define the problems they face, come up with breakthrough ideas and then take action on these new ideas.” Here I like “breakthrough idea. It implies difficulties were overcome. Not only is it important for students to conjure up ideas, but also they need to take action. For my proposal creative problems solving will be defined as “overcoming a challenge by implementing a valuable breakthrough idea.”

What Is the Creative Problem Solving Process?

“Everyone who has ever taken a shower has an idea.
It’s the person who gets out of the shower,
dries off and does something about it who makes a difference.”
- *American engineer and entrepreneur*
Nolan Bushnell

The introduction The Universal Traveler: a soft – systems guide to creativity, problem solving and the process of reaching goals reads:

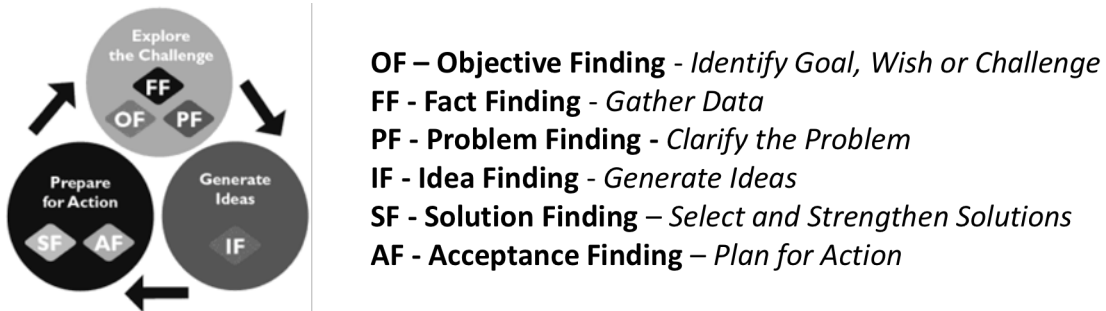
“Life is a continual sequence of encounters. Some are unavoidable; to be enjoyed or suffered by choice. Others can be controlled consciously. Creative problem – solving is a process of dealing intelligently with those situations that can be controlled. A creative problem – solver is a ‘designer’; a person intending to improve what exists or to find clear paths through dilemmas or challenging situations and arrive at satisfying solutions.” (Koberg & Bagnall, 1981).

I love this approach to problem solving. “A designer intending to improve what exists appeals to those hoping to mend social issues as well as remedy personal matters.” Scores of high school students are not happy with their situations and CPS will unveil to them a process that could improve their circumstances.

Creative problem solving includes defining the problem, determining steps needed to solve the problem and actions to be taken. There are several problem - solving models like those of the Creative Education Foundation. (See Figure 6) Regardless of the model used, students will gain in depth knowledge about their topic, determine appropriate measures and

put their plans into action. Rich Ajan commented, “Creative problem solving tools help us flex our minds, redefine the problems we face, find path-breaking ideas and take suitable actions thereafter. It’s all about overcoming our mind’s conceptual blocks and finding multiple solutions to effectively solve a problem that we face.” (Ajan, 2014)

Figure 6 - The Creative Education Foundation Problem Solving Model

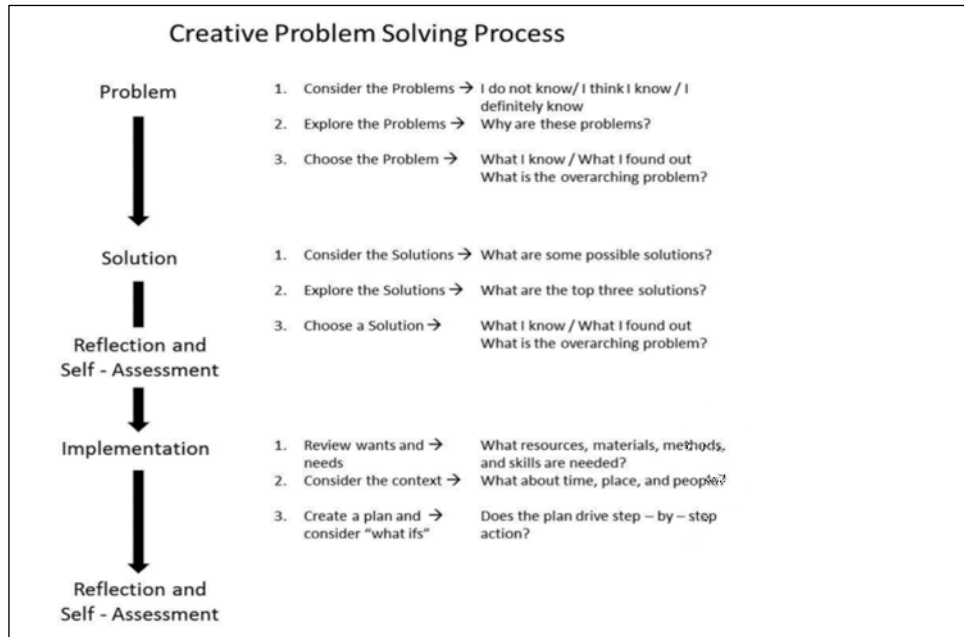


Source: <http://www.creativeeducationfoundation.org/our-process/what-is-cps>

Other problem - solving models include: Osborn’s seven – step CPS (Creative Problem Solving) Process which is similar to the scientific method (See Appendix C), Treffinger’s CPS Components and Stages which focuses on understanding the problem, generating ideas, and planning for action (See Appendix D), and Australia’s Mind Expander’s model used in international creative problem solving competitions. (See Appendix E) All models contain similar strategies. There are benefits to each. I appreciate Treffinger’s focus on understanding the problem; the Mind Expander’s expands on the process by including evaluation, communication and reflection and Osborn’s incubation period is special.

I find Drapeaus’ problem solving process best suited for the HSE CPS course. (See Figure 7)

Figure 7 – Drapeau's Creative Problem Solving Process



Source: (Drapeau, p. 124)

She describes her version in this way:

The creative problem solving process I like to use combines ideas from several different models. The process includes three major parts – the problem, the solution, and implementation of the solution – each of which is broken down into a series of steps. The model is appropriate for both independent and group problem solving, and each part of the process includes both divergent and convergent thinking. This process also includes student reflection and self – assessment at two points: after the first two parts (identifying problems and identifying solutions) and at the completion of the process. The importance of this reflection is twofold: asking students to examine their thought processes during the activity builds a metacognitive awareness of the problem solving process and creative skills, and student self – assessment promotes autonomy in the learning process, which improves student performance. (Drapeau p. 123)

The model may be modified by simplifying a step or by making a step more complex; steps may be eliminated in order to align the model with content and the student needs. However, there are core non – negotiable steps in the process that should remain constant. (Drapeau p.123)

She has done what effective educators do; she borrowed successful ideas and revised them to suit her own needs. I like its appropriateness for both individuals and groups. I also

agree it is helpful for students to examine their thought patterns throughout the activity. Teaching students to realize the influences on their mental processes can lead to more productive behaviors. Finally, a problem solving model must be flexible enough to meet the needs of any challenge.

VIII. CONCLUSION

Creative Problem Solving Is a Course Designed to Meet the Needs of Today's Students

Creative Problem Solving is an eighteen week course designed to prepare high school students for an unpredictable 21st century. I have high expectations for CPS students with many goals in mind. (See Appendix C) Ultimately, I envision students coming up with a challenge they are passionate about, gain a thorough understanding of their issue, develop the skills necessary to propose a solution, and attempt to solve the problem.

The class will begin with a journey of self – discovery. Students will reflect on influential people and events in their lives. They will gain an understanding of their own and others' creative processes. They will note the relevance of deliberate practice. And they will recognize excellence as a work – in – progress. As a result of understanding themselves better, students will improve their ability to evaluate choices and prioritize work. (Ortberg, J. 2015) Along this trip I will instill a sense of pride in my students and foster creative confidence by encouraging them to recall previous mishaps and consider the lessons learned from their failures. CPS students will experience successes that will encourage them to take bolder risks and forge a creative mindset.

We will engage in activities that spark imaginations and inspire curiosity. Students will learn to become contributing group members and appreciate the advantages of teamwork. We will practice effective communication skills and try many exchange methods. We will learn about and value creative problem solving strategies and apply them to several scenarios. Most importantly, CPS will offer students the opportunity to make a difference in their world. (See Appendix B)

Adjustments I Anticipate

As with any new endeavor, the inaugural run is a learning experience. I anticipate encountering a number of obstacles in my first try teaching CPS. My first question concerns the course timing. I wonder if one semester is too long, or if the course should cover thirty – six weeks. I find with teaching any subject there is a fine line between rushing through content and dragging it out. I will gauge student progress and understand when we need to review and

when to move forward. Next, I expect students to be responsible for their learning. This will be new to many. Previous experiences have shown me confident students excitedly accept the challenge while uncertain ones desire and wait for specific instructions. Throughout the sessions I will assure my students they are capable of overcoming barriers. My hope is by the end of the course all CPS students are hopeful learners ready to tackle any difficulty they might encounter.

Called to Serve Students

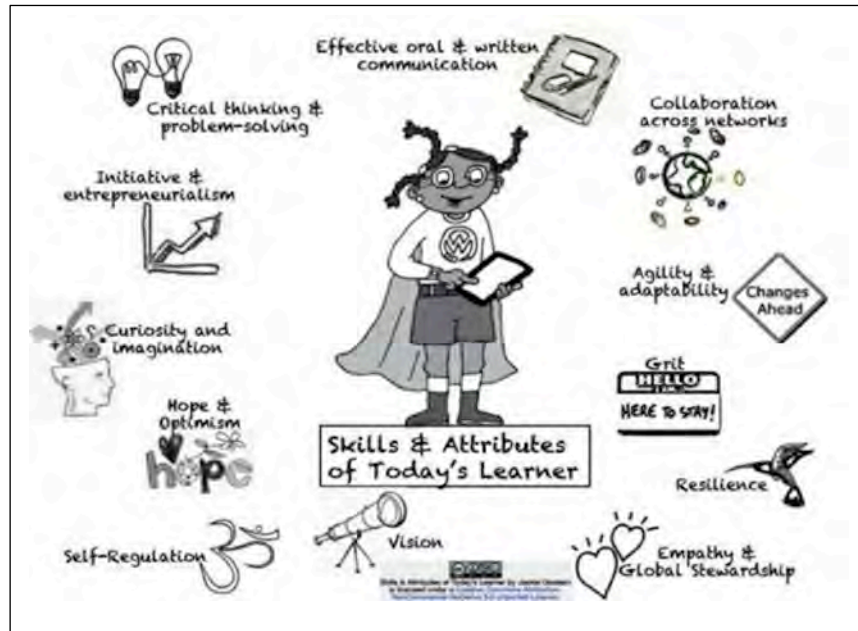
I maintain that educators today are called to serve their students by teaching them the skills they need to flourish in an unknown future. Sadly, education is doing a disservice to a generation of students who care more about their contribution to the greater good than how much money they earn. Education is not challenging students who have access to more information than any group before them. Education is stifling students who are looking for dare to be great situations. School days bore students because they find learning from the internet more compelling than learning from their instructors. Educators are not taking advantage of the fact that current events are broadcast faster today than any other time in history. Because the majority of teachers still believe they are “knowledge distributors,” they are missing the more impactful method of teaching - working alongside their students. This generation of students is searching for meaning in what they do and schools answer with scores of standardized tests. Today’s students are looking to make their marks on the world. Unfortunately, more often than not, school is smothering that fire rather than fueling it.

Teaching is my charge and I take it seriously. It is my responsibility to transform students into the bold, confident, risk – takers they are made to be. My challenge is to enable them to do more than survive, but also to live, learn and find a way to leave this planet in better shape than they found it. Teaching keeps me hungry and at times uncomfortable. And for that I am grateful. The chance to inspire learners is why I come each August more enthusiastic than I was the previous May. Concern for students who are falling through the cracks is what keeps me up nights. I pore over research, tweets and publications daily searching for ways to assure my kids that who they are becoming is more important than who

they are. I will be the one who convinces them “you can truly become anything you want if you set your mind to it.” My students’ future possibilities keeps me growing. Although it has taken me decades of experimenting with my techniques, I have come to the realization that teaching is my great adventure. Educating today’s youth is my contribution.

IX. APPENDIX

Appendix A Tony Wagner's Skills and Attributes of Today's Learner



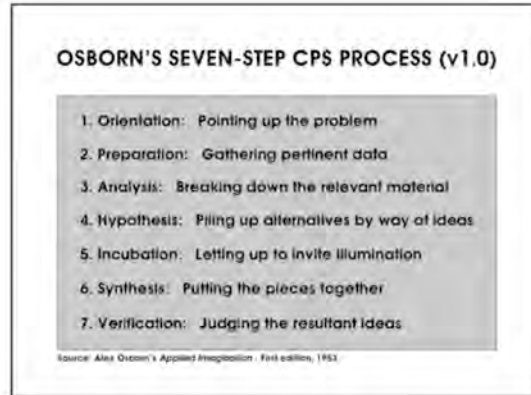
Source: <https://twitter.com/MisterJsLibrary/status/354054409115820032/photo/1>

Appendix B – Creative Problem Solving Course Description

During the course of Creative Problem Solving students will unearth a meaningful problem they would like to solve and develop the skills necessary to solve it. CPS will take students on an explorative personal journey. They will acknowledge what is important to them. They will recognize their creative influences. And they will identify their own creative processes. CPS will provide opportunities for individuals to spark their imaginations, foster creative mindsets, turn into contributing team members, become effective communicators and be transformed into unwavering problem solvers. Through class activities, individual and group work, in depth research and working alongside an experienced instructor Creative Problem Solving will offer students the skills necessary to flourish in a dynamic 21st century.

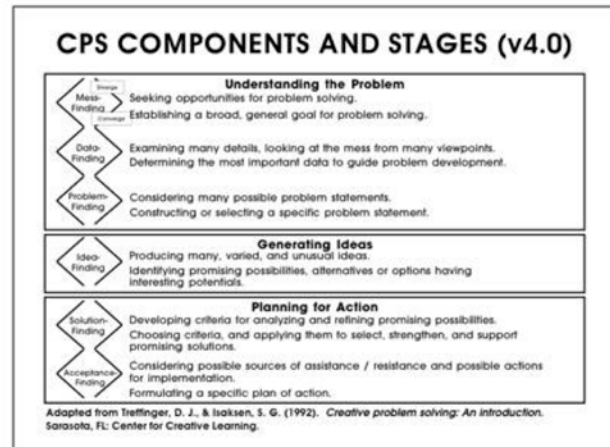
Appendix C

Osborn's Model



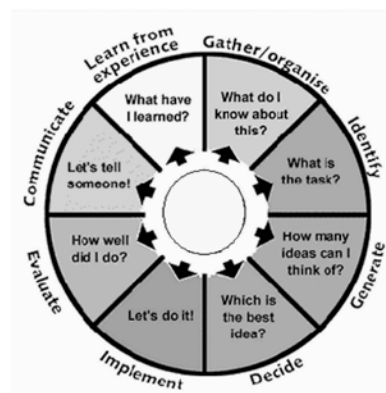
Appendix D

Treffinger's CPS Components and Stages



Appendix E

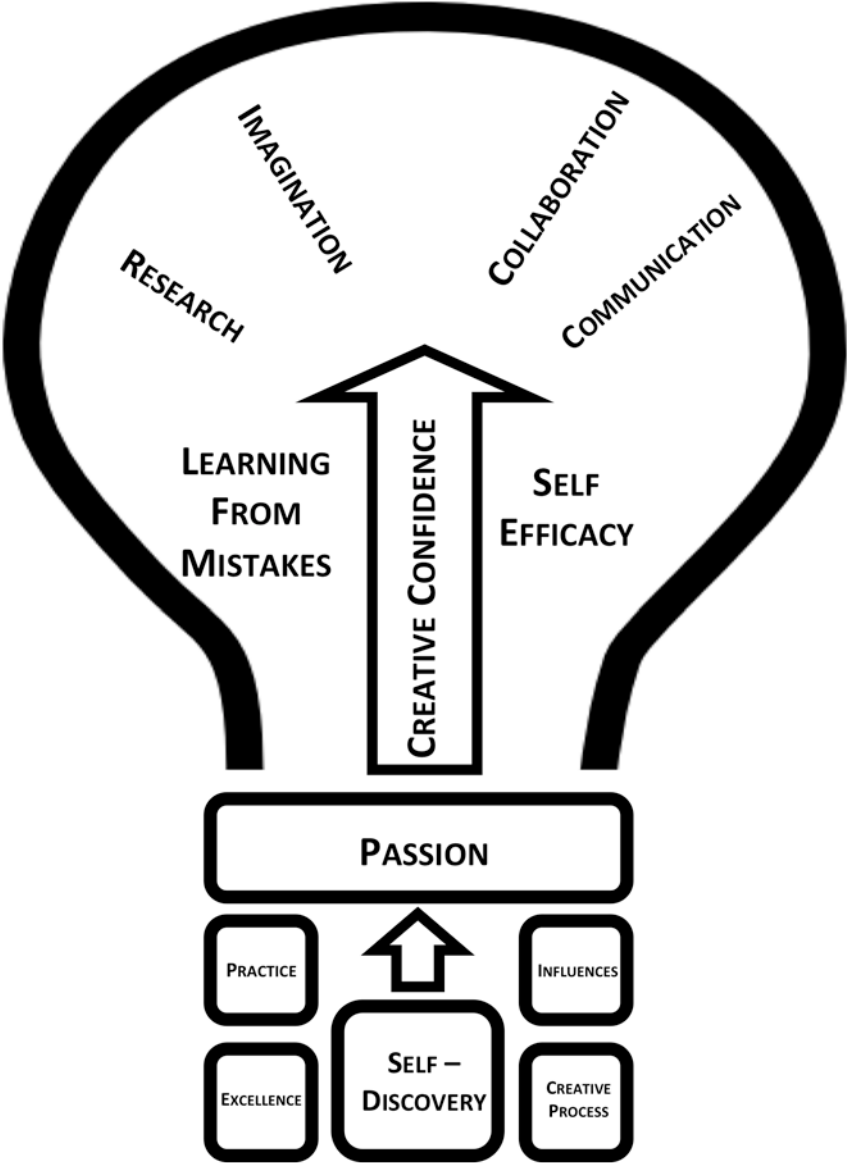
Australia's Mind Expander's model



Source: http://www.sthelen.vic.edu.au/libraryonline/mind_expanders.htm

Appendix F

Creative Problem Solving Infographic



X. WORKS CITED

- Ajan, Rich. "Creative Problem Solving: Out-of-the-box Solutions to Everyday Problems" Udemy/blog. 25 April 2014.
Retrieved November 11, 2014 from
<https://www.udemy.com/blog/creative-problem-solving/>
- Bandura, A. (1977). *Self-efficacy. The exercise of control*. NY: W.H. Freeman and Company.
- Barton, Paul and Coley, Richard. "The Mission of the High School: A New Consensus of the Purposes of Public Education?" Educational Testing Service. July 2011.
Retrieved December 5 from
<http://www.ets.org/Media/Research/pdf/PIC-MISSION.pdf>
- Coyle, D. (2009). *The Talent Code: Greatness Isn't Born: It's Grown, Here's How*. New York: Bantam.
- Drapeau, P. (2014). *Sparking Student Creativity: practical ways to promote innovative thinking and problem solving*. Alexandria: ASCD
- Ericsson, K., Krampe, R., & Tesch-Römer, C. (1993). The Role Of Deliberate Practice In The Acquisition Of Expert Performance. *Psychological Review*, 363-406.
- Glover, J. A., Ronning, R. R., and Bruning, R. J. (1990). *Cognitive psychology for teachers*. New York: Macmillan.
Retrieved December 21, 2014 from
<http://www.apa.org/education/k12/practice-acquisition.aspx>
- Kelley, T., & Kelley, D. (2013). *Creative confidence : unleashing the creative potential within us all*. First edition. London: William Collins.
- Koberg, D., & Bagnall, J. (2003). *The universal traveler: A soft-systems guide to creativity, problem-solving, and the process of reaching goals* (Updated classic ed.). Menlo Park, Calif.: Crisp Learning.
- Land, G. & Jarman, B. (1993). *Breaking Point and Beyond*. San Francisco: HarperBusiness.
- Ortberg, J. (2015). *All the Places to Go...How Will You Know?: God Has Placed before You and Open Door. What Will You Do?* Chicago: Tyndale.
- Pink, D. H. (2009). *Drive: The surprising truth about what motivates us*. New York, NY: Riverhead Books.

Rich, C., & Mitchell, M. (1997). *Stained glass basics: Techniques, tools, projects*. New York: Sterling Pub.

Robinson, K., & Aronica, L. (2015). *Creative Schools: The Grassroots Revolution That's Transforming Education*. New York: Penguin Publishing Group.

Seelig, T. L. (2012). *InGenius: A crash course on creativity*. New York: HarperOne.

Siegle, D. (2000). An Introduction to Self-Efficacy.
Retrieved January 26, 2015, from
<http://www.gifted.uconn.edu/siegle/selfefficacy/section1.htm>

van Alphen, P. (2011, Dec). Imagination as a transformative tool in primary school education. *Research on Steiner Education*, Volume 2 Number 2, pp. 16-34 Research on Steiner Education
Retrieved February 20, 2014 from
http://www.cfce.org.za/downloads/research/staff/van_Alphen_P,_2011,_Imagination_as_a_transformative_tool_in_primary_school_education.pdf

Wagner, T., & Compton, R. A. (2012). *Creating innovators: The making of young people who will change the world* (First Scribner hardcover edition.). New York: Scribner.

Wagner, T. (2013, May 22). The Other 21st Century Skills.
Retrieved February 4, 2015 from
<https://usergeneratededucation.wordpress.com/2013/05/22/the-other-21st-century-skills/>

Wagner, T. (2015, January 16). The Other 21st Century Skills: Educator Self-Assessment.
Retrieved March 4, 2015, from
<https://usergeneratededucation.wordpress.com/2015/01/16/the-other-21st-century-skills-educator-self-assessment/>

Wagner, T. (2011, January 27). Rigor Redefined - Even our "best" schools are failing to prepare students for 21st-century careers and citizenship.
Retrieved April 29, 2015, from
<http://www.tonywagner.com/244>

Warner, J. (2014). Education Reformers Don't Know What "College Ready" Means.
Retrieved October 16, 2014, from
<https://www.insidehighered.com/blogs/just-visiting/education-reformers-dont-know-what-college-ready-means>

