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Designing a Toolbox to Improve Creative Output: A Guide for Cultivating Critical, Creative, and Conceptual Thinking Skills in an Increasingly Distracted Society

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DESIGNING A TOOLBOX TO IMPROVE CREATIVE OUTPUT: A GUIDE FOR CULTIVATING CRITICAL, CREATIVE, AND CONCEPTUAL THINKING SKILLS IN AN INCREASINGLY DISTRACTED SOCIETY

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ABSTRACT

Frequent digital distractions can hamper undergraduate design students' ability to perform the kind of deeper level thinking needed for creative problem solving and creative output, yet there are tools that can help students focus on the present and delve deeper into their creative work. This paper focuses on the details of a pedagogical toolbox created for educators of undergraduate design students to target critical thinking, creative thinking, and conceptual thinking (the 3Cs) in order to improve creative output. I explain how critical, creative, and conceptual thinking work holistically to develop and promote creative output. By demonstrating 3Cs tools and activities, I provide educators with ideas and methods for challenging students to be present, think creatively and critically, and build conceptual awareness. Through testing, refinement, and adaptation of the tools, I collect data through student surveys and compare creative output results between control groups for one particular tool. I aim to prove that creative output is not fixed, but can be developed and strengthened with practice, time, and the right tools. Customization of the toolbox tailored to what is most effective for individual educators' pedagogy, course content, and students' critical, creative, and conceptual thinking abilities is explained. This paper also acknowledges our reliance on digital technology and how it can be leveraged to engage creative thinking in the virtual spaces where students spend their time.

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Designing a Toolbox to Improve Creative Output: A Guide for Cultivating Critical, Creative, and Conceptual Thinking Skills in an Increasingly Distracted Society

A few years ago, an undergraduate student of mine studying fashion design at the Massachusetts College of Art and Design sat struggling in one of her senior-level design classes. As part of an assignment, she had decided to base a five-piece apparel collection off of a single coat she designed and created the previous year. Her design was inspired by the story of *Little Red Riding Hood*, and her research and concept development of the prior year was reasonably straight-forward. For her new designs, she was required to push her concept further by changing something about it to make it novel. She grappled with imagining her designs beyond a series of red coats that looked similar to the initial design. Many of her peers were also struggling with their approaches to the same assignment.

In an undergraduate class critique, another senior faced a long silence after presenting a finalized 2D fashion design project. Her work was highly underdeveloped, visually chaotic, and carelessly executed, particularly at the senior-level. Her peers, required to provide her with feedback, did not know what to say about her work. When the silence finally broke, the feedback that was offered was erroneously positive. Students were reaching for things to say, and latched onto her use of color, which was mediocre, but further developed than the rest of her work. She did not receive any constructive criticism in the feedback from her peers, which she desperately needed in order to improve and grow as a designer. Students were not aware of how to provide a successful critique for the type of work that needed it most.

A sophomore in an introductory-level fashion design course that I teach refused to discuss her work or answer any questions that arose during her critique. She stood next to a

beautiful dress made of industrial-strength blue paper towels with black spray-painted areas that accentuated the blue. Her silhouette of cascading curved and layered paper towels created impressive volume and drama. Her work was strong, but she appeared to struggle with the garment fit as well as with some finishing techniques.

While the student's project was under development, my one-on-one discussions with her revealed that she was less interested in feedback and dialog than other students. However, she was able to discuss a small amount of her process and requested advice when she struggled with aspects of construction. When the day came for her to present her garment to the class, she shut down and refused to speak about it. I asked her questions, hoping that my usual prompting would assist her with the discussion. She delivered defensive answers to questions related to her inspiration and process, such as “I don’t know” or “nothing”. The other students jumped in and tried too, but she gave them the same curt answers. She was completely unresponsive during her presentation. I was surprised at her seemingly obstinate behavior and the lack of a productive outcome during her one-sided critique. Her inability to articulate her inspiration, objectives, or process seemed to indicate that she needed to practice reflection, critical thinking, and metacognition to examine her thoughts and discover what motivates her to create. She seemed to lack an awareness of how to think about and discuss the intentions behind her work. This caused a failure in the communication of her ideas during her critique, which meant that she could not receive optimal feedback or any type of intellectual dialog around her work, ultimately leading to a less than ideal end product.

In the three examples mentioned above, students were not aware of how to push themselves effectively and may not have realized their optimal potential. This, in turn, affected their creative output. In this synthesis, I examine the potential underlying causes of students’

struggles with successful creative output and what might be done to build upon and strengthen creative output for all students.

My Background

I am an Assistant Professor in the Fashion Design Department at the Massachusetts College of Art and Design (MassArt). I have been in this position for several years. Prior to that, I worked part-time as an adjunct instructor at MassArt and Mt. Ida College for over ten years. During my years as an adjunct instructor, I held numerous full-time creative jobs in the areas of childrenswear design, color design and trend forecasting, costume design and construction for theater and television, costume and creature construction for Macy's animatronic holiday window displays in New York City, and most notably, the design of military protective apparel and gear for the United States Army.

The seven years of experience I gained working for the Department of Defense as a U.S. Army Clothing Designer provided me with comprehensive knowledge in many technical and functional aspects of design and problem-solving. This knowledge involved protecting parts of the body from physical injury and extreme weather and creating gear to withstand challenges such as abrasion, shock, and chemical/biological agents. Unlike typical fashion design industry jobs, in my role at the Army, I was responsible for all phases of design and production for my projects. As lead designer for the Cold Temperature Arctic Protection System, I conducted market research, held in-depth discussions with Army Mountain Warfare School soldiers experienced in working under frigid conditions, and translated their needs into innovative design concepts.

Additionally, I was granted a utility patent for an item I designed that covers the groin and rear areas of the body and comes down the inside of the leg to protect the femoral artery of soldiers in the periphery of an IED blast, which, when severed, is a life-threatening condition.

My experiences as a creative professional have given me insight into how design is used to benefit others and how clothing design can be a valuable tool for solving problems. I regularly incorporate the insight gained from my experiences at the Army and in the fashion industry into my lectures and class discussions on design, production, market research, understanding customer needs, and the various ways design can be used to benefit others.

The achievement of being granted a patent for one of my designs is recognition and evidence of my ability to produce novel ideas and generate successful creative output. This accomplishment is difficult to attain and highly regarded in the field of apparel design. The successes I have achieved in my career motivate me to foster and guide others toward more effective creative output and have inspired me to create a toolbox for developing and improving creative output, which involves the creation of something possessing originality.

Problem Finding: Creative Output

Over the summer, a new couple bought the house next door to me. I can see their yard from my kitchen window. As I am eating, I see my neighbor take his dog into the backyard daily for some exercise. Rather than playing or engaging with the dog, he looks at his phone the entire time. This behavior is in stark contrast to the woman that lived there before. She would take her dog out and play with him, tossing him toys to fetch. When she was not playing with her dog, she spent time nurturing her beautiful garden. I never saw her merely standing there, looking at a

cell phone. The main difference between these two homeowners is that the new neighbors are in their 20s, while the neighbor that lived there before is in her 60s.

I have nothing against my new neighbors. In fact, we already have a great rapport and help each other out when needed. My neighbor's behavior is not unusual. Digital technology that fits in a pocket can be tempting, especially for those who have spent their entire lives with it there. This form of digital technology seems to entice people to disengage from their physical surroundings. It also appears to makes it difficult for them to be present with other people or even with pets, as in the case of my neighbor.

The palpable lifestyle difference between my former neighbor in her 60s and my new neighbors in their 20s is something I have observed slowly unfold in my classrooms over the past twelve years. The pervasiveness of digitally-driven disengagement seems to have taken a toll on students' creative processes.

I have noticed a shift in students' thinking and their ability to make the type of connections and associations needed for deep engagement in the creative process. I have observed a general decline in students' conceptual thinking, and I also sense a loss of critical thinking and the ability to think with creative insight, all of which affect their overall creative output. Many of my students today seem to require more assistance and struggle with the process of generating original ideas. While not true for all students, there appears to be less creative intuition and less deep reflection happening as a whole. The deterioration of these types of thinking is adversely affecting the work my students produce as well as how they produce it and has the potential to eventually affect their ability to become successful problem-solvers in their chosen creative fields.

In talking to colleagues, I have found that they also observe students in recent years struggling with producing critical, creative, and conceptually-driven work. Some topics we have discussed include students' tendency to give up more readily and display less perseverance and grit, display more negative attitudes toward putting time into an assignment, and demonstrate fear of experimentation while perceiving mistakes as failure rather than part of the creative process. We have also conferred regarding students' tendencies toward trying to do things perfectly the first time, instead of having the clarity to see what is gained from the processes of experimentation and learning. Another thing I have noticed and discussed with colleagues is that a number of students seem to demonstrate less curiosity, an essential component in driving autonomy and personal investigation.

My Perspective Based on Personal Observations and Data: How Digital Technology Affects Creativity

I attribute at least part of the shift in students' thinking over the years to the ubiquity of digital technology. I am currently teaching Generation Z, the generation born beginning in 1997. Known as "digital natives," these students are the first who have grown up entirely immersed in digital technology (Prensky, 2012). Television shaped the lives of Baby Boomers, while Generation X was influenced by the computer revolution, and Millennials' lives were impacted by the explosion of the internet (Dimock, 2019). The significance for Generation Z is that all of these technologies have surrounded them since birth (Dimock, 2019).

> The iPhone launched in 2007, when the oldest Gen Zers were 10. By the time they were in their teens, the primary means by which young Americans connected with the web was through mobile devices, WiFi and high-bandwidth cellular service. Social media, constant connectivity and on-demand entertainment and communication are innovations Millennials adapted to as they came of age. For those born after 1996, these are largely assumed. (Dimock, 2019, para. 11-12)

Unlike television and desktop computers, the advent of portable technology with internet connectivity introduced pocket-sized, omnipresent distractions. Audio notifications, visual pop-ups, and physical vibrations of cell phones create a pervasive multi-sensory kind of noise which can be difficult to ignore and is incredibly distracting in a learning environment. The day to day diversions of digital technology can take valuable time away from students' abilities to think and reflect, focus, experience the verbal and physical cues important in face-to-face socialization, sleep, experience boredom, solve problems, discern opportunities, and acknowledge and appreciate their surroundings including the people around them. These diversions can also rob students of the ability to enjoy and possess a general awareness of what it means to be present.

A 2019 Pew Research Center study found that "Younger adults are at the vanguard of the constantly connected: Roughly half of 18- to 29-year-olds (48%) say they go online almost constantly and 46% go online multiple times per day. By comparison, just 7% of those 65 and older go online almost constantly and 35% go online multiple times per day" (Perrin and Kumar, 2019, para. 4).

The implications of young people being online "almost constantly" can have negative consequences such as anxiety and depression (Majidaei, Pireinaladin, and Kasaee, 2015) and higher exposures to online harassment. "The vast majority of teens (90% in this case) believe online harassment is a problem that affects people their age, and 63% say this is a major problem" (Anderson, 2018). Frequent and inopportune cell phone use can also affect sleep quality and academic performance. A Kent State University study of undergraduate college students revealed that "using the cell phone at bed time is negatively related to sleep quality and that using the cell phone in class and while studying is negatively related to academic

performance. Thus, cell phone use during these circumstances should be controlled" (Li, Lepp, and Barkley, 2015, p. 456).

Distractions from cell phones can be difficult for young people in particular to avoid. Cell phones are engaging, distracting, and habit-forming by design. Former Google designer Tristan Harris offers, "If I'm Facebook or I'm Netflix or I'm Snapchat, I have literally a thousand engineers whose job is to get more attention from you. I'm very good at this, and I don't want you to ever stop. And you know, the CEO of Netflix recently said, 'Our biggest competitors are Facebook, YouTube and sleep.' I mean, so there's a million places to spend your attention, but there's a war going on to get it. (Zomorodi, 2017, 8:52).

With ultra-accessible tiny portable computers touting texting, email, news, podcasts, social media, video chats, games, and internet browsing in people's pockets, along with myriad notifications to keep them updated on all of the details, it is a wonder that people, particularly those who identify as being online almost constantly, find any time for undirected thoughts.

Tiffany Shlain, filmmaker and author of *24/6 The Power of Unplugging One Day A Week*, postulates, "When we space out on our own, we're making our own connections and following them. But when we do it online, we're following the prompts created by others" (Shlain, 2019, p. 128). These prompts can dubiously manipulate our thoughts, leading us down pathways guided by marketing or politics, or simply distract us from original thoughts and new insights (Shlain, 2019). I believe that these distractions from original thoughts and new insights have a significant impact on students' overall creative output.

A digital existence can rob people of time to think, to experience visual and auditory silence, to experience mind-wandering, and to appreciate boredom. Boredom has a wonderful way of leading us to discover new insights and driving us to pursue creative problem finding and

creative problem solving as we seek various ways to occupy our time (without involving digital devices). Part of the brain activated during boredom is called the default mode network (Zomorodi, 2017), and it is associated with mind-wandering and unconscious thought. In a study on creativity using structural MRI research, “a positive correlation was found between creative performance and gray matter volume of the default mode network. These findings support the idea that the default mode network is important in creativity and provide neurostructural support for the idea that unconscious forms of information processing are important in creativity” (Kühn et al., 2014, p. 152).

People benefit from quiet time away from digital technology. It can be time to simply think, work out who we are, set goals, play with ideas, process our day, wonder about things without searching for immediate answers, consider our strengths and how to build upon them while mitigating our weaknesses, work through our problems, and hope and dream. “In the default mode is when we connect disparate ideas, we solve some of our most nagging problems, and we do something called ‘autobiographical planning’. This is when we look back at our lives, we take note of the big moments, we create a personal narrative, and then we set goals, and we figure out what steps we need to take to reach them" (Zomorodi, 2017, 3:44).

With digital devices all around us, how often is there space in our lives for this type of reflection? What effect does this have on young people who have never known anything other than a digital existence? How often have they allowed themselves the opportunity to experience this mental place of thought and reflection? The host of WNYC’s Note to Self, Manousch Zomorodi, set up a challenge on her podcast that she called *Bored and Brilliant*, in which thousands of listeners temporarily gave up their cell phones (“Bored and Brilliant," 2015). During the challenge, younger participants found themselves unsure of what they were feeling

after having detached themselves from digital technology (Zomorodi, 2017). “Some of [the young people] told me that they didn't recognize some of the emotions that they felt during challenge week, because, . . . if you have never known life without connectivity, you may never have experienced boredom” (Zomorodi, 2017, 13:26).

Without time to think, how can young people, or anyone for that matter, be creative? How can they solve problems? Zomorodi notes that researchers at the University of Southern California studied teenagers who used social media while doing homework or talking to their friends. After two years, the teenagers were "less creative and imaginative about their own personal futures and about solving societal problems, like violence in their neighborhoods” (Zomorodi, 2017, 13:26). Zomorodi points out that, “we really need this next generation to be able to focus on some big problems. . . . No wonder CEOs in an IBM survey identified creativity as the number one leadership competency” (Zomorodi, 2017, 13:26).

It should be acknowledged that digital technology, such as cell phones, has made tremendous advances in our lives and has brought people together like never before. I am seeking to support the generation of constant users who are never without their cell phones (and all the distractions that come with them) in order to help them learn to make space for reflection. Digital technology can make our lives better if and when it is used in moderation. Using digital technology in moderation can be quite a challenge for young people in today’s digitally dependent world, and they may not even realize that this is a valid challenge to address. I believe that the first step in helping young people like my college design students build their creativity, is to demonstrate how being present can have positive effects on creative output.

As I work to help my college students through their creative struggles, I have wondered how I can provide them with the tools needed to make reflective, meaningful space for

themselves to think and ripen their creative output in the classroom, but also outside of class, where much of their creativity develops.

Growth Mindset as a Foundation for Improving Creative Output

A colleague of mine who works in the Liberal Arts department at MassArt created a course that aims to get art and design students to articulate their thoughts about their art and their art-making process through writing. I believe she created this class in response to some of the struggles she sees in students' abilities to be present and think critically, creatively, and conceptually. Her method of teaching the course focuses on bringing students back to the physical world by working in physically hand-made journals, using a physical word finder or thesaurus in class, creating hand-made image collaging, and writing with a pen and paper. She also brings in food and tea to create an experience of being in the moment. There is no computer or phone use allowed to generate the students' artist statements. I invited her to some of my classes to help students produce artist statements that describe their design collections, and I witnessed her methods first-hand. The writings my students produced in one four-hour class were poetic and ethereal. I could see both their struggles and triumphs with critical, creative, and conceptual thinking unfolding as they worked without digital technology. Her work is inspiring, and it reinforced my belief that the right tools, guidance, and practice, can help students improve their critical, creative, and conceptual thinking skills over time.

Psychologist Carol Dweck developed the concept of a fixed mindset versus a growth mindset. "In a fixed-mindset students believe their basic abilities, their intelligence, their talents, are just fixed traits. They have a certain amount and that's that . . . In a growth-mindset students understand that their talents and abilities can be developed through effort, good teaching and

persistence. . . . they believe everyone can get smarter if they work at it" (Morehead, 2012, as cited in Heggart, 2015, para. 4).

In the three opening stories I relayed, students were not aware of how to work to their optimal potential, and their creative output was hindered as a result. Like general intelligence, creative output is not fixed. An individual's creative abilities and output have the capacity to stretch and grow, and this growth can be guided and increased over time. The right tools can help students realize their full potential and engage them more deeply in their creative development and output. When my student said she could not imagine Red Riding Hood inspired designs that went beyond an obvious collection of red coats, she demonstrated that she did not know how to think critically, creatively, or conceptually.

Dweck has demonstrated growth-mindset teaches young people that effort and challenges help to build connections in the brain that make a person smarter. Students that run from challenges do not learn, while those that accept challenges as a way to grow and learn actually get smarter (Dweck, 2014). Similarly, students studying in creative fields who avoid or give up on creative challenges are stagnating their creative output, while those that perceive creative challenges as experiences to learn from are strengthening their abilities and developing their creative output.

Students who give up easily on creative challenges might become motivated to tackle them upon learning of specific tools they can apply to help them improve creative output. Students who become aware of tools that can increase creative output, and understand how to use them, are provided an opportunity to understand that like intelligence, creativity and creative output can be developed. Effective tools for developing creative output can demonstrate to

students that growth-mindset works. "High creative self-efficacy and growth mindset, rather than fixed-mindset, appear to be linked to desirable creative outcomes" (Intasao and Hao, 2018, p. 3).

Defining the Solution

In my career as a creative professional, my studies in the Critical and Creative Thinking graduate program at the University of Massachusetts Boston, and in my first-hand experiences as an educator developing and refining methods to help students cultivate their thinking in a way that pushes their creative output, I have identified what I believe are three components that feed creative output: critical thinking, creative thinking, and conceptual thinking (the 3Cs). I have also come to understand that critical, creative, and conceptual thinking must work together to produce strong creative output.

It is essential for art and design students to continually develop creative output to grow and succeed both academically and personally. Creative output is crucial to their long-term success and is often imperative to their livelihood.

Creative output can be easy to identify in the classroom. The work that leaves a lasting impression has strong visual communication and aesthetic, successfully grabs attention with its message, focal point, intricate details, bold simplicity, balance, or use of form, texture, function, and color will stand apart. However, defining creative output can be as subjective as defining creativity. One perspective is that creative output is a creative idea that possesses originality, appropriateness, and obviousness (Howard, Culley, and Dekoninck, 2007). As an artist, designer, and design educator, I define creative output as one’s ability to formulate an idea with a unique point of view expressed through an artistic medium.

One of the components that I see shaping creative output is critical thinking. Davies and Barnett define critical thinking as "reasonable reflective thinking focused on deciding what to believe or do" (Davies and Barnett, 2015, p.32). Peter Taylor, former director of the Critical and Creative Thinking Graduate Program at the University of Massachusetts Boston, defined it as "understanding ideas and practices better when we examine them in relationship to alternatives" (Taylor 2002, as cited in Taylor, 2019, p. 1). In the context of my design courses, I define critical thinking as the reflective thinking, reasoning, and decision-making that makes a valuable contribution to what informs a student's design choices. Critical thinking is essential to art and design education because creative work without reflective thinking and informed decision-making lacks substance and will communicate as such. Students must be able to think critically to generate a viable idea that can be carried from an initial concept to a completed design product or work of art.

Students must be able to speak about their work in ways that demonstrate that they have used critical thinking to reflect on what they are creating and why they are creating it. The Encyclopedia of Educational Theory and Philosophy asserts that "critical thinkers must be fair- and open-minded individuals who base their decisions about what to believe and do on reasoned reflection" (Norris, 2014, pp. 198-200). Designers, in particular, must present or pitch their ideas to an audience of potential buyers, or design managers and directors in a way that convinces others to subscribe to their ideas. The designer must convince their audience that they not only have viable ideas but that their ideas can be made into producible, marketable products that will sell. Art and design students need to practice critical thinking to develop strong reasoning skills so that they may successfully communicate their ideas to others. Critical thinking is a necessary skill for building and maintaining their livelihood.

Another component that I see shaping creative output is creative thinking. Creative thinking "refers to how people approach problems and solutions -- their capacity to put existing ideas together in new combinations" (Amabile, 1998, pp. 76-87). I observe creative thinking to be the ability to imagine or see things in new ways, which can bring about original ideas, create new perspectives, and lead to problem-finding and problem-solving. Design students need creative thinking to successfully generate, prototype, and implement new ideas. Creative thinking is vital because, without the ability to imagine or see things in new ways, original ideas cannot form. Without original ideas, creative output would stagnate, and we could not progress as a society.

It is important to note that critical thinking and creative thinking do not exist in silos. One informs the other, and elements of each come together to produce successful creative output. The Encyclopedia of Educational Theory and Philosophy posits:

> On the one hand, it is a documented fact that inventions, scientific discoveries, and artistic performances—all undeniably creative achievements—require the exercise of critical judgment in their execution. On the other hand, critical thinking typically requires imagining alternatives and likely outcomes and devising approaches to problems—once more, all undeniably creative achievements. Thus, it is broadly recognized that critical thinking plays an essential role in creative thinking and that creativity is at the heart of thinking critically. (Norris, 2014, pp. 198-200)

Critical and creative thinking are inter-reliant. One cannot exist without the other. Therefore, both critical and creative thinking should be explicitly addressed in art and design pedagogy.

While creative thinking may involve putting ideas together in new ways, conceptual thinking is more complex because it involves putting entire concepts together in new ways. In

the context of my design classrooms, I define conceptual thinking as the ability to form new ideas by making connections or associations between seemingly disparate concepts. Often, the more incongruent the concepts, the more unique the resulting ideas. Conceptual thinking involves seeing the big picture, thinking abstractly, and building an innate sense of finding patterns in things that may not initially seem related. The ability to do so can generate stronger, more original creative output. Conceptual thinking provides students with "the chance to search for big ideas—to generalize, summarize, and draw conclusions by looking at their learning in a holistic way" (Marschall, 2019, para. 2).

In the video *Looking at Learning...Again, 3, Conceptual Thinking*, Dr. Joseph Novak points out, "It's concepts and relationships between concepts that constitute knowledge" (Grainger, 1999). While understanding concepts and identifying the relationship between them can facilitate a deeper understanding of our world, connecting more complex or disparate concepts can generate the kind of original thought and creative output that contributes to the type of new ideas that change our world.

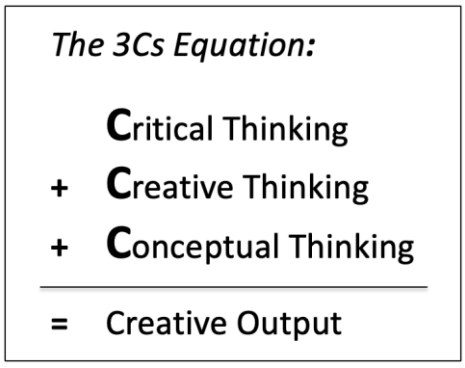
For example, a child who first understands the basic concept of money and connects it with the basic concepts of food and shelter will form an understanding of how selling goods and services can be a means of survival. By contrast, in the 1940s, when George de Mestral connected the disparate concepts of cockle-burs, which he found stuck to his dog's fur after hiking, with the concept of clothing, Velcro was invented. The ability to connect complex or disparate concepts moves beyond merely understanding something in a new way toward constructing innovative thinking and producing original creative output. It is the difference between learning and making the mental leap toward innovating.

Students with a broader array of concepts in their library of understanding have more information to pull from and are more likely to be successful at utilizing conceptual thinking to generate creative output. “If students do not have a strong understanding of individual concepts, they’ll struggle to see patterns and make connections between them” (Marschall, 2019, para. 4). Students must formulate an understanding of concepts so that they can move from understanding something in a new way to developing new ways of thinking about things, which can then lead to original, creative output.

Conceptual thinking cannot happen without critical and creative thinking working in tandem to help construct a mental leap. Critical thinking forms an understanding of concepts and can begin to identify patterns in those concepts, while creative thinking is needed to make disparate associates between concepts to formulate new ideas. In this way, critical, creative, and conceptual thinking work holistically to develop and improve creative output. This relationship can be visualized as the 3Cs equation (figure 1).

Figure 1

The 3Cs equation.



The operative word and common denominator in critical, creative, and conceptual thinking is *thinking*, as well as the ability to do so without distractions. Thus, I have curated, developed, and adapted a set of tools that can help generate creative output by encouraging students to be present through engagement in various methods that stretch their critical, creative, and conceptual thinking skills.

Intro to the 3Cs Toolbox

The purpose of the 3Cs toolbox is to provide educators additional ideas and methods for engaging critical, creative, and conceptual thinking in students in order to foster creative output. The toolbox can also be used by creative professionals or directly by students. Faculty using the 3Cs toolbox are encouraged to experiment with the tools and adapt them to curate a customized toolbox tailored to what is most effective for their pedagogy, course content, and students' critical, creative, and conceptual thinking abilities. As an iterative document, faculty can continuously develop and add to it over time.

For example, an educator teaching a first-semester foundation course at MassArt is teaching students recently out of high school and from varying yet to be determined levels of critical, creative, and conceptual thinking ability. This educator may choose to implement and perhaps adapt the RAD LIBS tool (see tool #4) due to its straight-forward level of use (plug-in words and see what new ideas are generated), versus trying the mind-wandering exercise which may be better suited for students who have a bit more experience using critical, creative, and conceptual thinking skills to problem-solve in art and design challenges. Or perhaps the mind wandering tool is adapted by a faculty member seeking to experiment with using a prompt to focus the direction of the mind wandering. It is my hope that faculty explore and experiment with the tools, adapt, adjust, and add to them, and continue to shape the toolbox as it works best for them.

The choices made by faculty about which tools will effectively engage their students and bring out their best work can have a direct influence on students' connection to the tools and their intrinsic motivation for using them in future classes or work/life endeavors. When educators help students feel comfortable using the tools, teach them how to have fun with the tools, and

help develop an understanding of how the tools can affect creative output, students' intrinsic motivation for continued use of the tools increases. Students may wish to assemble a 3Cs toolbox of their own, based on which tools worked best for them. Tool use can encourage growth-mindset, particularly when repeated over time, as this can demonstrate to students that their creative processes and creative output can improve and develop with practice.

A customized toolbox can take on a physical manifestation in the form of a journal, binder, or digital system that is accessed when needed and adapted to different challenges, situations, or assignments. It can consist of a menu of various 3C tools and exercises that worked best for the user, along with notes on how each tool was adapted, or perhaps how tools were modified to fit with specific activities and assignments.

The potential implications of a toolbox that involves customization include some variation in learning experiences and outcomes. Students will likely walk away from their classes with different exposure to various tools depending upon which tools faculty decide to implement and how they decide to use them. This exposure will provide various students with distinctive skill sets and strengths. However, the main goal of the toolbox will be met if faculty find one or more tools useful (in either their current or modified state) and if some students' creative output is improved as a result. It will be even more effective if students use and apply some of the tools outside of the requirements of the classroom. Examples of a customized toolbox will be included in the 3Cs guidebook (see Next Steps section). Below I present six tools that utilize critical, creative, and conceptual thinking.

Problem Solving: Implementing a Solution

Tool #1: Mind Wandering and its Effects on Creativity

"[C]reativity is fostered by tasks that allow the mind to wander" (Kaplan, 2012, para. 1).

I began thinking about mind-wandering or daydreaming as something as a relic of the past, something that existed, at least more frequently, before the advent of smartphones. I remember a time when I would walk to the train station, wait for the train, travel for an hour and arrive at my destination with my full attention on a combination of my surroundings and inward thought. I remember drawing for hours at a time with no interruptions. I also remember sitting in parks, taking lunch breaks, and walking around the city, again with my attention on both my surroundings and inward thought. Sometimes these moments occurred while I was with other people, but when the conversation lulled, there was space for the mind to wander. I often wonder what it is like for young people today who may never have experienced that unencumbered lifestyle. Perhaps if they were lucky, they spent some of their childhood in that space.

In preparing to present and discuss trends and trend research to my sophomore fashion design classes, I came across a developing trend that resonated with my musings. The new Dutch lifestyle trend, known as niksen, began as a reaction to digital distractions and busy lifestyles. Niksen is the practice of doing nothing. "Whereas mindfulness is about being present in the moment, niksen is more about carving out time to just *be*, even letting your mind wander rather than focusing on the details of an action" (Gottfried, 2019, para. 3). Niksen is said to promote relaxation and combats stress as a way to avoid burnout. It has been cited in recent news articles as well as being named one of the top 20 trends that will emerge in the 2020s by the trend forecasting and analytics website, WGSN. "As human beings rather than human doings, people will want to actively allow the brain to wander, which will enhance creativity and problem-solving, reducing anxiety, and even slow aging" (WGSN, 2020). Daydreaming is a "propitious

mental state for creativity, insight and problem solving" (Begley et al., 2009, p. 36 as cited in Mann and Cadman, 2014, p. 167).

The concept of niksen inspired me to do more research on the benefits of mind-wandering as I was curious about how it might benefit my students' creative thinking. I discovered that mind-wandering engages default-mode processing to activate creative thought. "Unique among the species, we have the ability to sit and mentally detach ourselves from our surroundings and travel inward, recalling the past, envisioning the future, and imagining worlds that have never existed. Neural activity during such inward-directed thought, [is] called default-mode processing" (Wilson et al., 2014, p. 75). This information helped to validate my belief that mind-wandering is an important component in creative thinking.

I also read a research study that tested the effects of mind wandering on creative problem-solving. The study "demonstrated that taking a break involving an undemanding task improved performance on a classic creativity task . . . This improvement was observed only for repeated-exposure problems" (Baird et al., 2012). This led me to wonder how my students' creativity might improve when taking a break from one of their creative tasks. I then designed a mind-wandering activity to see if my students' creativity would improve.

I inserted the mind-wandering activity into an existing in-class assignment during a sophomore-level creative fashion class. I was curious to see how the activity might change students' creative thinking and creative output. I teach two sections of this course, so I tried it in one section, but used the other section as a control group to compare results.

Although the specific activity in which I incorporated the mind-wandering was new to the students, I considered the activity to be a repeated-exposure problem, since it involved draping and designing on the dress form and my students had prior experience with this.

During the activity, students worked for approximately 60 minutes to create a garment on the dress form made from non-textile materials such as paper plates, garbage bags, and window screen material using brass fasteners, packing tape, or staples to hold everything together. Ten minutes into the activity, I asked students to stop the activity for five minutes to let their minds wander. My reasoning for inserting mind-wandering partway into the activity was due to the findings that "mind-wandering was only helpful for problems that were already being mentally chewed on" (Kaplan, 2012, para. 7). I instructed the students to allow their minds to wander freely and not necessarily with the task at hand in mind. Before beginning the five-minute mind-wandering activity, I requested that my students bring their cell phones up to the front desk so they would not become distracted by them.

Another study I encountered influenced my design of the mind-wandering activity. *Just think: The challenges of the disengaged mind* by Wilson et al. examines how mind-wandering can be challenging.

> In 11 studies, we found that participants typically did not enjoy spending 6 to 15 minutes in a room by themselves with nothing to do but think, that they enjoyed doing mundane external activities much more and that many preferred to administer electric shocks to themselves instead of being left alone with their thoughts. Most people seem to prefer to be doing something rather than nothing, even if that something is negative. (Wilson et al., 2014, p.75)

In light of this information, I provided my students with foam squeeze toys and fidget spinners as a way to offer an external activity that was non-pain inducing (see image 1). This tactile experience gave their hands something mundane to do while they allowed their minds to

wander. After the five-minute activity, I gave them back their cell phones, took back the toys, and they resumed their projects. I then observed their behavior.

Image 1

A selection of curated gadgets provided to MassArt students during a mind wandering exercise designed to promote creative output as part of a classroom activity.

At the beginning of the exercise, I observed students choosing to use materials that most resembled the properties of fabric with which they are most accustomed to using. They mostly chose plastic bags as their material because they could drape and pin them on the dress form, much like the traditional fabrics with which they are familiar. I was enthusiastic about the rigidity of the paper plates, which are more structural and challenging to use. I expected the plates would challenge students to think divergently and approach their designs differently than

usual, so I was naturally disappointed that none of the students selected paper plates. However, after participating in the mind-wandering exercise, I noticed a sudden change in the majority of students' material choices. Within several minutes of the end of the mind-wandering exercise, most students went back to the available materials and chose paper plates to integrate into their existing designs. This change in material choice created an explosion of sculptural designs that were wonderfully creative and demonstrated divergent thinking. Another faculty member had observed the designs when walking by the classroom and later commented that she noticed many creative ideas. Twelve students in one class participated in the experiment, while eight students in the other section of the class did not participate. Proportionally, the percentage of students choosing the difficult material was much higher in the group that participated in the mind-wandering exercise. Furthermore, the sudden change in material choice immediately after the exercise demonstrates that mind-wandering had a noticeable effect on their creative planning and creative output.

I surveyed students after the activity to ask them some reflective questions about the process and record their thoughts on whether the activity produced more creative results or problem-solving. I asked them metacognitive questions such as *Do you think the activity produced more creative results or helped with problem-solving? Did anything surprise you about this exercise? Did you learn or take anything away from this experience (good or bad)?* Metacognitive questions were asked as a way to link critical thinking skills with creative thinking skills. When creative thinking is supported by reflective thinking, design students learn to recognize, analyze, and form a deeper understanding of their creative processes.

Responses to the question asking if the activity produced more creative results or helped with problem-solving included insight regarding having “space to think” or “room to breathe”

without feeling pressured to "come up with ideas," ability to plan before continuing, improved problem-solving, and gaining the ability to envision the big picture.

Even though directed to let their minds wander naturally, which I noted could take them somewhere that did not involve their current projects, seven out of eight students' reflective feedback I received referenced thoughts related to their projects, which implied that their minds were not wandering aimlessly, but were wandering in a way that was consciously or subconsciously tackling the exercise at hand.

When asked if anything surprised the students about the exercise, responses included observations about how it was difficult to allow their minds to wander, how they were looking forward to implementing new ideas formed while mind-wandering, and one student mentioned that she was surprised she did not think directly about the task at hand.

For the final question regarding if the students learned anything or took anything away from this experience, whether good or bad, their responses demonstrated that they garnered new insight regarding making time to think. "I learned that there is so much space to think if you allow yourself the time." They also noted that stepping away from the task at hand provided them with a "clearer mind," the importance of thinking for a minute to plan things out, and stepping away to see "the bigger picture."

Out of a class of twelve students, ten were present, and eight responded to the feedback prompts sent to them in an email to fill out during class (see Appendix A for full survey responses).

The next steps for implementing a mind-wandering exercise will explore the idea of directed mind wandering, where the same sequence as above is followed, except that general mind-wandering will be replaced with a suggestion to keep the mind-wandering semi-focused on

the task at hand. I plan to investigate and answer if mind wandering can be directed and still be considered mind wandering, as well as compare the creative output of directed mind-wandering to general mind-wandering. I also plan to explore how mind-wandering might affect students' creative output when practiced repeatedly over the course of a semester or longer.

I assert that design students who learn how to allow their minds to wander, use specific external thinking tools, and engage in specially designed conceptual activities, will produce qualitatively more creative work. Zoning out is zoning in, tapping into a place in our minds where creativity and problem-solving occur. "Baird's work shows that allowing the brain to enter this [wandering] state when it is considering complex problems can have real benefits. Zoning out may have aided humans when survival depended on creative solutions" (Kaplan, 2012, para. 9). The survival art and design students' careers depends upon their ability to generate creative solutions, and I believe that mind-wandering is a tool that the potential to help move them from surviving into thriving.

I designed this activity as a means of helping students to be present through engagement of their default-mode processing for greater access to creativity. Removing their cell phones during the mind-wandering activity also allowed them to be present.

Tool #2: Plus/Delta Feedback and the Studio Critique

I first learned about plus/delta feedback through the Critical and Creative Thinking graduate program at the University of Massachusetts, Boston. It is a tool used often in the program by faculty to evaluate students and for students to assess their peers.

"Feedback that begins with an appreciation (*plus* or +) makes any subsequent suggestion for change (*delta* or △) more likely to be heard and taken up" (Taylor and Szteiter, 2012, p. 121).

I appreciate the tool's ability to generate a balanced amount of feedback covering both what is working well and what could be strengthened for improvement. It also lends a collaborative element to the feedback process. "It also has an effect on our giving of such feedback, namely, to shift us away from being consumers or critics and make us collaborators or supporters of the ongoing development of the recipient of our feedback" (Taylor and Szteiter, 2012, p. 121).

Recently, I began looking at ways for my students to develop their critical thinking further as it applies to their creative practices and the classroom critique. I decided to start by concentrating my work on the critique process so that I could delve deeper into how critical thinking can be applied in one type of context within my field.

In the classroom art and design critiques that I conduct regularly, I set out to challenge students to see things from various perspectives, make informed decisions about the feedback they give one another, and the messages students intentionally or unintentionally craft within their work. I investigated how critical thinking techniques might be woven into the classroom critique process and how that might affect the feedback students provide one another.

Formal fashion design critiques include: a presentation of a design or a body of work in its finished form to the class, articulation of inspiration, communication of a narrative, concept, and process, critical feedback from both student peers and faculty – a range of positive and constructive feedback is desired, dialogue between the student presenting and their audience. During classroom critiques, students presenting can gain an understanding of ways to improve their work, how they speak about it, and general communication skills. Conversely, students participating as an audience in the critique gain experience in making observations about others' work, providing constructive feedback, and developing communication skills.

Some barriers to a successful critique, which I have encountered in my courses or I am otherwise aware of include: students' peers only provide positive feedback for fear of hurting feelings, students only provide positive feedback due to being intimidated by strong work (they do not know how to give critical feedback when the work is strong), and student presenters have trouble articulating and communicating their ideas or have anxiety about speaking in front of a group. Additional barriers I have encountered or am otherwise aware of include: a student's work is not understandable or is aesthetically weak, and their peers do not know how to respond, students make many subjective comments such as "I like your colors," the presenter becomes defensive when constructive comments are given, which prevents students from offering further feedback and engaging in dialogue, and certain subject matter intimidates students or makes them uncomfortable and no one comments.

I created and implemented a new critique exercise to avoid some of the barriers to a successful critique. During this exercise, students are given quiet reflection time for about 15-20 minutes before the formal critique in order to view others' work up close and evaluate it individually. As work is viewed, students write anonymous plus/delta comments on post-it notes, which they put beside the work they are viewing (see image 2). They offer one plus and one delta comment per design or body of work presented.

Image 2

MassArt student work with plus/delta feedback generated by students.
From left to right: Tyler Pongkham, Laiba Azhar, Rosa Lay, Dat Duong, Nina Wisch

After this process, each student presents their work to the group for verbal feedback. If there are not enough delta comments, I ask if anyone wants to volunteer some of the deltas they wrote. If no one offers deltas, I ask the student presenter to read some of the delta comments next to their work, and their peers can offer additional comments if desired. The student presenters are allowed to keep their plus/delta comments for further reflection.

I tried the proposed approach several times over the course of a month with both seniors and first-year students and found that it is quite successful in engaging students in their ability to offer more in-depth and honest feedback. I believe this is due to several factors. One reason for honest and in-depth feedback is that they are provided time to observe and reflect upon what they

are viewing without the influence of others' opinions. They have more time to reflect and offer meaningful comments. It also helps that they can view the work up close, noticing details they may not otherwise see from several feet away. Another reason it is successful is that they seem to open up with more honest comments when they are writing and not put on the spot to speak. This is particularly helpful for introverts who often need time to think before speaking, and for this reason, may remain quiet during critiques. Offering the option of speaking their delta comments rather than expecting some to provide these comments seems to empower them to provide their thoughts. I also noticed that time to process the work seems to help students generate thoughtful feedback for work that seeks to challenge norms, ideals, or may be controversial. Upon implementing a plus/delta studio critique, I observed that the stronger students were finally provided with suggestions for further improvement, and the weaker students were able to hear comments that would help them to improve their weaknesses. All students received sufficient positive encouragement too.

The interactivity of this exercise, with everyone getting up and walking around the room, writing, and posting notes next to the work, also seems to wake everyone up a bit and get them to feel more engaged and involved in the process. No one can check out during this type of review process since everyone must contribute. I also join the students in contributing written plus/delta feedback. “Research among students indicates that the most successful design studios are those where traditional power relationships are broken down. These are studios where the students become actively involved in the process, and where they have the opportunity to discuss their work with jurors and with each other, all within an environment of mutual respect and interest” (Utaberta, Nangkula, Hassanpour, Badiossadat, and Bahar, 2012, p. 1847). I believe that the new critique technique I have created levels the playing field as far as power is concerned, as it

actively involves my students in the evaluation process, provides ease of opportunity for a dialogue to discuss work with their peers and me, and offers a respectful platform with which to do so.

In examining the art or design critique practices of other educators, I found evidence that critical thinking is being considered. However, a formal plus/delta style of the evaluation was not evident in the research I found.

In one example of a classroom critique practice for architecture design students, Utaberta et al. suggest that a balance of positive and negative criticism is desired. "These results may be interpreted as individual components that constitute what makes good jury experience. These components include criticism that is balanced between discussing positive and negative aspects of the student's work; a small class; specific comments on how the student can improve the project; and a variety of jurors to allow for differing viewpoints in the feedback given to a student" (Utaberta, Nangkula, Hassanpour, Badiossadat, and Bahar, 2012, p. 1846).

I disagree with their use of the term "negative" and suggest that delta comments would make design critiques more positive by offering students feedback encapsulated in a more positive light, which provides ways to improve rather than outright negative criticisms of their work.

In another studio critique approach, Heidi May discusses hermeneutic inquiry, which involves a process where understanding continuously moves back and forth between the parts and the whole of what is being understood. She posits that

> A pedagogical approach to the studio critique can be one that is decentralized, with participants placed in simultaneous view of both the artwork and each other. The artwork in between the participants becomes the subject of inquiry, allowing for interpretation to

> move back and forth from the art object (the part) to the idea being expressed (the whole). (May, 2011, p. 35)

I found May's ideas encouraging in that I believe these are areas I have been working toward improving. By asking students to study each designer's body of work closely, make written plus/delta comments, listen to the designer express their ideas, and then participate in verbal plus/delta feedback, a dialogue is sparked that allows all involved the opportunity to interpret and discuss the body of work being presented alongside the idea being expressed. While I believe that this is a natural part of an art or design critique, it must be carefully facilitated to be successful. The careful facilitation created in the plus/delta studio critique process involves giving each student a voice in their written plus/delta feedback that is later translated into ease of dialogue during verbal classroom feedback.

I designed this activity as a means of helping students to be present through interaction between students and the work they are viewing, documentation of critical thinking using paper and handwritten comments, movement around the classroom, and group engagement and dialog between students and me.

Tool #3: The SCAMPER Brainstorming Tool

SCAMPER is a creative brainstorming tool originally developed by Alex Osborn in 1963 and later turned into an acronym by Bob Eberle in 1971. SCAMPER stands for Substitute, Combine, Adapt, Modify, Put to other uses, Eliminate, Reverse (Eberle, 1996). When these techniques are applied to a problem, idea, an existing design, or product, novel solutions can be generated.

I have found that the SCAMPER tool can be quite useful in generating ideas for new products. I decided to share the tool with my seniors to see if it helped them develop new ideas for fashion design.

The first time I shared the SCAMPER tool was in the class with the aforementioned student struggling to come up with a novel idea for a collection based on her former Little Red Riding Hood designs. I explained the tool to the class and provided them with some examples of how the tool might change an existing design to make it new. Some students seemed to understand the tool, while others, including the one struggling with the Little Red Riding Hood designs, were having difficulty. I decided to use her design idea as an example for the class to understand how SCAMPER can be applied to fashion design, in order to demonstrate how the tool can be applied directly to a student's work.

I explained to the class how the Modify technique in SCAMPER could be applied to create more varied designs. Osborn's Modify segment of SCAMPER asks, "Change meaning, color, motions, sound, odor, form, shape?", (Davis, 2004, p. 192). In my example, I used the modify technique to bring in an element from the wolf in the Little Red Riding hood story to apply to one of the student's red coat designs. I described how the wolf's head could be extrapolated and placed onto each shoulder of the red coat. Then, to make the coat more marketable, the furry heads could be modified and simplified by changing their form and shape into abstracted fur epaulets on the shoulders. It is this type of creative thinking that I hope my students will achieve independently. While most students understood the example, some were still unable to successfully generate their own types of original thinking using SCAMPER in their work. To my dismay, the student inspired by Little Red Riding hood gave up quickly,

settled for varying her color palette, and changed some of the lengths of the coats. She simply was not able to think creatively.

Since introducing the SCAMPER exercise to fashion design students, I have learned that students generally need more time with the concept. I found their grasp of the idea most successful when students practice SCAMPER in class as a group, then immediately practice it on their own during class, and finally apply it to their projects independently for homework.

My second attempt at using the tool was more successful than the first. I explained the use of the tool with a video example of it being used to transform a product (there were no fashion design examples that I can find). I then explained that we were going to use the same process together to transform an existing garment into something new. My aim this time was to have the students work as a group and get everyone involved in the process of transforming one idea. I asked for a student to volunteer an example of a garment they had designed and built that they thought was unsuccessful. I requested a student comfortable with rapid illustration to volunteer to be our illustrator. The illustrator drew the designated unsuccessful garment on the board. Then as a group, we began applying the SCAMPER technique. We went through the acronyms in the word one by one, with students volunteering ideas and with the illustrator making changes to the garment drawn on the board. The final result was a completely different silhouette with transformed design details. The original garment was completely unrecognizable, and the new design was aesthetically appealing. The students were surprised at the successful transformation of the piece.

After this initial group exercise, I asked students to try this on their own with a garment they wished they had designed differently. They seemed to get the hang of it a bit better, and I was able to help them if they got stuck.

Finally, I asked them to do this again for homework, this time taking a single design and turning it into a varied yet cohesive collection. I found that the final results of this were much more interesting than a series of red coats with varying hemlines.

After trying this adapted version of SCAMPER, I find that approximately half of my students connect with the concept, and about half of those students used the tool independently on future projects. I have spoken with a handful of students who told me that they use the tool beyond the course to generate ideas for projects.

I designed the in-class portion of this activity as a means of helping students to be present through group engagement and interaction between students and me. Another way this activity encourages presence is through the occasional movement that happens through the room as the illustrator gets up to draw on the board, and other student participants occasionally get up to help add to or clarify some part of the drawing.

I continuously seek methods to engage students' creative thinking, so I decided to adapt the SCAMPER tool to make it more accessible to a wider number of students. The following adaptation of SCAMPER creates an entirely new way of using the tool, becoming a new tool in itself. Although requiring the use of the original SCAMPER tool as a first layer, my tool adds a second layer as a means of making it easier to use for fashion design students.

Tool #4: RAD LIBS (Featuring the SCAMPER Technique)

The following is an example of how I adapted a 3Cs tool to best suit the needs of my course and the needs of my students based on their level of critical, creative, and conceptual thinking.

After some trial and error using the SCAMPER tool with fashion design students, I found a way to adapt the tool to make it more interactive, engaging, and simple to use. I combined the SCAMPER tool with the MADLIBS writing game to create RAD LIBS, a new brainstorming tool for generating creative output. My general idea was to create a tool inspired by something relatable to students, such as MADLIBS. This is a game many students have used before for entertainment, and they will likely understand the basic concept which leads them to use the tool in a playful way to generate new ideas and creative processes that can be adopted into their design practice.

The RAD LIBS word generator (figure 2) contains a list of suggested nouns and adjectives as starters. Participants are also provided a fill-in-the-blank word generator, and they are encouraged to add to the list provided or create their own lists from scratch (figure 3), depending upon what they are looking to design.

The participant begins by writing down all numbers from 1 - 22 on a separate piece of paper. They then cut them out so that each number is on its own small square, and they place the numbers into a bowl.

Without looking, the participant reaches into the bowl and pulls out a number. Then they find the word that corresponds to that number in the first column of the word generator (figure 2, noun - parts of garment or body column). The word is then written into the blank noun spot under example 1 in the idea generator (figure 4). The participant puts their number back in the bowl, mixes the numbers up, and pulls out another number. This number then corresponds with the second column on the word generator (figure 2, adjective column). The word is then written into the blank adjective spot under example 1 in the idea generator (figure 4) to complete the idea. There are two opportunities to generate this type of idea, under example 1. Example 1

utilizes the ‘C’ for combine from the SCAMPER acronym to combine nouns with adjectives (figure 4). In this case, the nouns represent parts of the body or part of the garment since I am working with fashion design students.

Example 1 in Figure 4 shows a sample of randomly chosen nouns and adjectives that generate an idea. *Take the noun and make it/them adjective*. becomes *Take the shoulders and make them pointed.* could generate pointed sleeve caps on a garment. *Take the neck and make it heavy.* could generate a large cable knit collar or cowl on a garment.

For example 2 on the idea generator (figure 4), the participant reaches into the bowl and pulls out a number. Then they find the word that corresponds to that number in the first column of the word generator (figure 2, noun - parts of garment or body column). The word is then written into the blank noun spot under example 2 in the idea generator (figure 4). The participant puts their number back in the bowl, mixes the numbers up, and pulls out another number. This number then corresponds with the third column on the word generator (figure 2, random noun column). The word is then written into the blank random noun spot under example 2 in the idea generator (figure 4) to complete the idea. There are two opportunities to generate this type of idea under example 2. Example 2 utilizes the 'S' for substitute from the SCAMPER acronym to substitute nouns with other random nouns (figure 4). In this case, the first noun represents parts of the body or part of the garment since I am working with fashion design students.

Example 2 in Figure 4 shows an example of randomly chosen nouns and random nouns that generate an idea. *Substitute the garment/body part with a random noun.* becomes *Substitute the hips with a goat.* might generate the curved, spiraling shapes of a goat’s horns at each hip, producing a sculptural garment with padding sewn into the hips to create an avant-garde silhouette. *Substitute the sleeves with a gorilla.* might generate elongated sleeves that are

reminiscent of a gorilla's long arms. The sleeves might be scrunched up and secured at the wrists to create a heavily gathered effect or could be left long, hanging past the hands for a dramatic impact. If desired, the random nouns could be restricted simply to animals or plants, for example, to generate more controlled or cohesive results.

Figure 2

The RAD LIBS word generator.

RAD LIBS for DESIGNERS

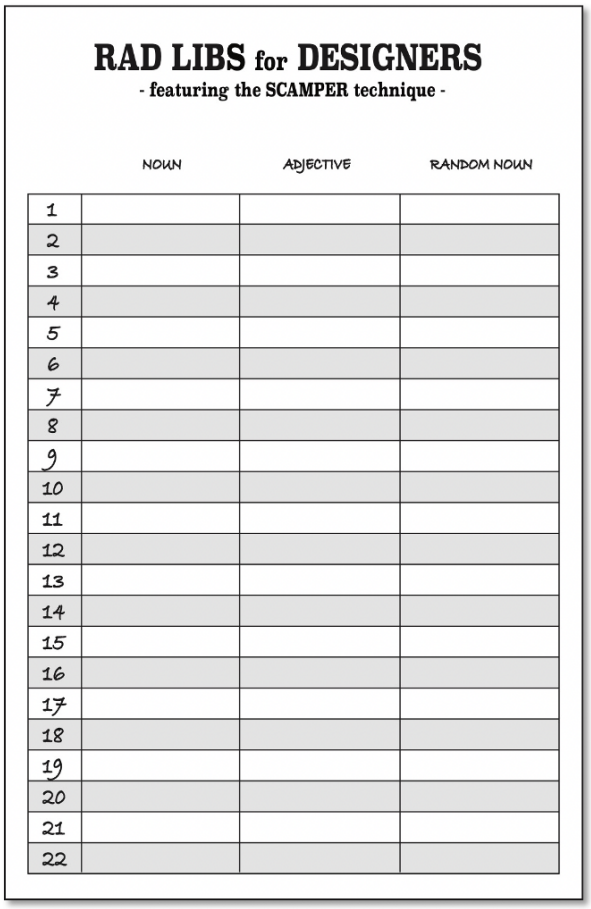
- featuring the SCAMPER technique -

	NOUN (PARTS OF GARMENT OR BODY)	ADJECTIVE	RANDOM NOUN
1	shoulders	rounded	goat
2	waist	pointed	whiskers
3	chest	sloped	hair
4	hips	curvy	face
5	neckline	squared	cheese
6	cuffs	tall	candy
7	collar	tiny	hairbrush
8	sides	enormous	pig
9	armscyes	fluffy	dog
10	sleeves	smooth	eyelashes
11	belt	spiked	fan
12	buttons	vertical	gorilla
13	zipper	horizontal	vase
14	buckle	rough	bird
15	pockets	bumpy	insect
16	fly	open	swing
17	legs	invisible	sloth
18	calves	wide	tent
19	thighs	narrow	glacier
20	ankles	heavy	bannana
21	neck	light	rose
22	sleeves	reversed	cactus

Note. This page provides participants with suggested nouns and adjectives as examples to add to the idea generator (figure 3).

Figure 3

The RAD LIBS fill-in-the-blank word generator.



RAD LIBS for DESIGNERS

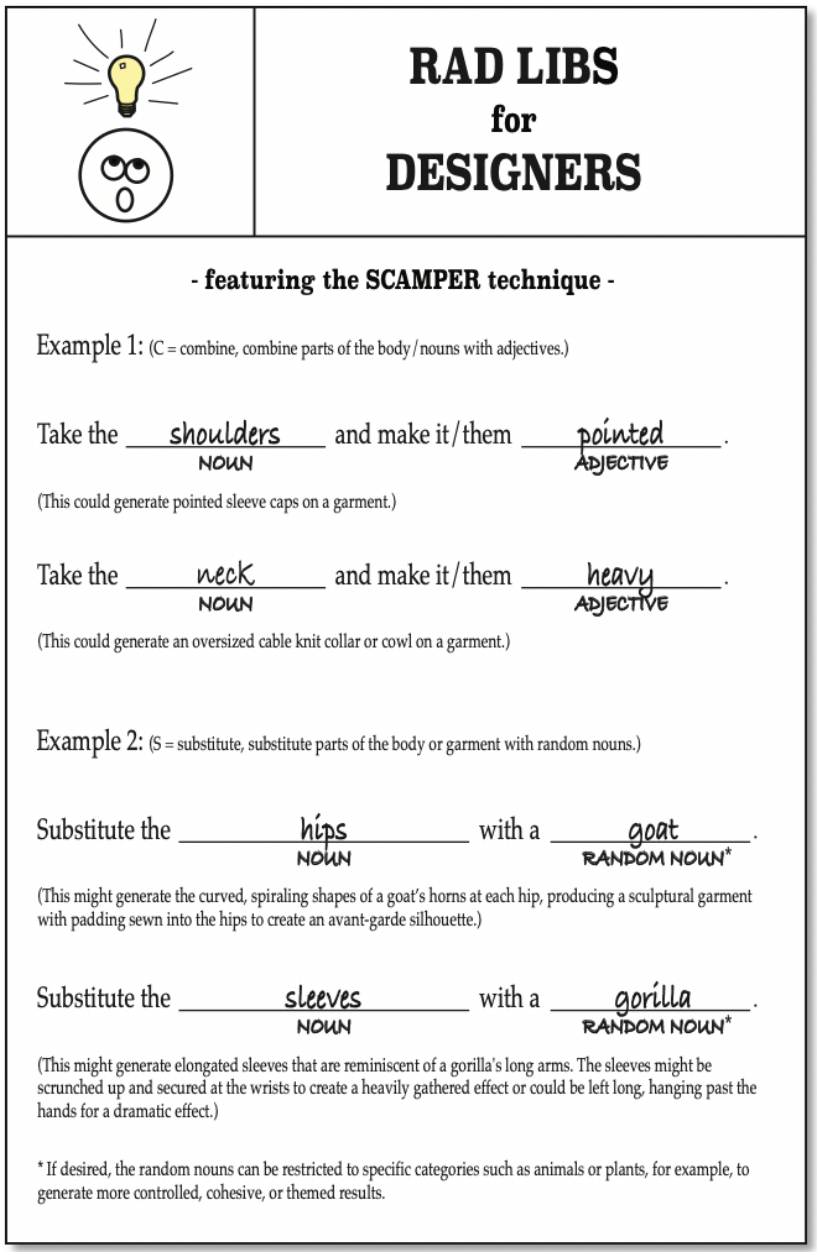
- featuring the SCAMPER technique -

	NOUN	ADJECTIVE	RANDOM NOUN
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			

Note. Participants can add new words to the suggested words lists or generate new lists of words.

Figure 4

The RAD LIBS idea generator.



RAD LIBS for DESIGNERS

- featuring the SCAMPER technique -

Example 1: (C = combine, combine parts of the body / nouns with adjectives.)

Take the ___shoulders___ and make it / them ___pointed___.
NOUN ADJECTIVE

(This could generate pointed sleeve caps on a garment.)

Take the ___neck___ and make it / them ___heavy___.
NOUN ADJECTIVE

(This could generate an oversized cable knit collar or cowl on a garment.)

Example 2: (S = substitute, substitute parts of the body or garment with random nouns.)

Substitute the ___hips___ with a ___goat___.
NOUN RANDOM NOUN*

(This might generate the curved, spiraling shapes of a goat's horns at each hip, producing a sculptural garment with padding sewn into the hips to create an avant-garde silhouette.)

Substitute the ___sleeves___ with a ___gorilla___.
NOUN RANDOM NOUN*

(This might generate elongated sleeves that are reminiscent of a gorilla's long arms. The sleeves might be scrunched up and secured at the wrists to create a heavily gathered effect or could be left long, hanging past the hands for a dramatic effect.)

* If desired, the random nouns can be restricted to specific categories such as animals or plants, for example, to generate more controlled, cohesive, or themed results.

Note: Without looking, participants choose from a bowl of numbers that then correspond to words from the RAD LIBS word generator (figure 2). Then they write the words into the designated blank spaces to form new ideas.

RAD LIBS is useful for many kinds of designers, artists, and other creative professionals. It can be adapted to different creative pursuits or even business ideas by replacing the body/garment parts with nouns related to industrial design, architecture, art, marketing, etcetera.

I believe that when an accessible tool like RAD LIBS is practiced often by design students, it has the potential to become a habit, and eventually, the technique need not explicitly be used, at least not all of the time. Using creative thinking tools like RAD LIBS can demonstrate to students that their creative abilities can grow through the use of a tool, helping to foster a growth mindset.

This tool is designed to help students be present through the use of writing, cutting, and physically pulling numbers from a bowl. It also would naturally lead fashion design students to sketch out their ideas as they are generated.

Tools like RAD LIBS are useful building blocks for students to learn as they prepare to enter the industry and navigate the pressures of rapid idea generation and ideation as they design within a brand identity or for the needs of private clients and respond to rapidly shifting market demands.

Tool #5: Metacognition

I am presenting metacognition as a tool for consideration, with brief examples of how I am beginning to use it in my classrooms. I plan to develop and adapt this tool further in my future pedagogy, and it is my hope that other educators will be inspired to do the same.

Metacognition is “the monitoring and control of thought” (Martinez, 2006, p. 696) sometimes referred to as “thinking about thinking” (Martinez, 2006, p. 696). When learners are aware of their thinking, they can understand their strengths and the strategies they use when

learning. Once conscious of their strategy, they can determine if it is working or needs to be reevaluated. “If we can help our children think about their strategies, we can help them become more skilled learners” (Taylor, 2012).

Taylor (2012) references John Flavell’s ideas regarding young people’s needs for metacognition in three areas: an awareness of knowledge, an awareness of thinking, and developing an awareness of thinking strategies. An awareness of knowledge is an understanding of what the student knows and the ability to survey, question, read, recite, and review. An awareness of thinking is the ability to understand cognitive tasks and select strategies for the task, as well as to develop an awareness of thinking strategies, which includes understanding approaches to directed learning. Directed learning involves self-assessing, self-questioning, and revising. *“Students learn to monitor and direct their own progress, asking questions such as ‘What am doing now?’, ‘Is it getting me anywhere?’. ‘What else could I be doing instead?’. This general metacognitive level helps students avoid persevering in unproductive approaches, to remember to check … and so on”* (Perkins & Salomon, 1989, as cited in Taylor, 2012).

Taylor posits the idea that facilitating and providing opportunities for students to notice their thinking is necessary to their metacognitive success. One of the methods she references is called "I used to think…, but now I think…" (visiblethinkingpz.org, as cited in Taylor, 2012). This activity encourages students to review and reflect upon what they have learned since the beginning of the course or topic. "By examining and explaining how and why their thinking has changed, students are developing their reasoning abilities and recognizing cause and effect relationships” (visiblethinkingpz.org, n.d.). Metacognitive abilities are fostered when the students reflect upon how their thinking has shifted and why.

In “The Impact of Metacognitive Instruction on Creative Problem Solving," Hargrove and Nietfeld investigated metacognition’s effect on the creative thinking strategies of first-year university students in a design program. Creative thinking strategies were taught weekly in a way that integrated them with metacognitive skill development. The study found that the students in the treatment group had significantly higher scores on measures of creativity than the control group of design students.

The verbalization of creative ideas and thought processes is an often overlooked and highly important part of the design process. I have noticed that the use of metacognitive strategies in my classrooms have enabled the students to have a deeper awareness of their thinking during design critiques, which enables them to more successfully evaluate both the work of their peers and their own work. Hargrove and Nietfeld describe the three levels of metacognitive mental models (Schraw & Moshman, 1995, as cited in Hargrove & Nietfeld, 2015, p. 296). I noticed that with the recent introduction of metacognitive instruction, my students have moved from the tacit metacognitive mental model where they have only implicit awareness of how they are critiquing the work of others and themselves, to the intermediate informal model where introspection is being developed. I hope that with time and practice, I can help my students reach the formal mental model in which they will be able to explicitly master creative thinking as it applies to design critiques and their individual creative work.

I have also used metacognition in classroom exercises, where students work alone and in groups. For example, I created a project incorporating critical thinking skills such as evaluation, reflection, and metacognition into an undergraduate course encompassing apparel design, career readiness, and design portfolio development and presentation. I randomly separated the class of seniors into groups of three or four and asked the students to create a cohesive apparel design

collection, featuring five designs that communicated a highly creative concept. The students were tasked to brainstorm and research concept ideas as a group and document their process. They were tasked to design the collection together, determine how to organize themselves into various roles, and appoint an illustrator to create the designs rapidly. The assignment directed them to think outside the box in terms of how they presented their visual work since they would need to find unique ways of presenting their work individually, later in the course.

I provided students with metacognitive questions to answer before the task such as: Where will we seek our research?, How much time will we spend researching ideas? These questions helped each group of students evaluate their collaborative planning process before it began, and I believe this helped them to work well together as teams.

The metacognitive questions sparked reflection and dialogue surrounding each group's approach to solving their challenges. There was also reflective dialogue where each group evaluated the process of designing their collection as a team, from assigning roles to carrying out various tasks. Each group member contributed to a shared written reflection statement on their processes and outcomes. In these reflections, they were prompted to answer I metacognitive questions regarding the project such as What are some things you discovered about working in a group?, What would you do differently if you were to do it again?, and What were some things you learned from your peers? Students reflected that they learned new problem-solving methods from others in their group and also learned different approaches to tackling a project that they had not thought about before. Each team was asked to reflect upon and verbally evaluate their work as well as the work of other teams.

I observed that the metacognitive questions and reflective statements engaged students more deeply in their projects, and helped them to reflect upon the approaches they took with

their work and their creative processes. When students reflect upon approaches to learning, they are able to review and revise their approaches and strategies the next time they do a similar task. Metacognition, when practiced over time, can build awareness and self-growth, and demonstrate a growth-mindset to students.

This tool is designed to help students be present through the use of reflection, writing, dialog, and collaborative design.

Tool #6: Concept Mapping

I am presenting concept mapping as a tool for consideration in a 3Cs toolbox. While I have not yet tested this tool in my classrooms, I plan to experiment with it, develop it, and adapt in future pedagogy, and it is my hope that other educators will be inspired to do the same.

Dr. Joseph Novak, developed concept mapping in 1972 as a visual way to organize thoughts and make connections between ideas. Unlike a mind map, which tends to focus on one concept, a concept map connects multiple concepts. “Concept maps are tools for organizing information in such a way as to encourage a deep level of integrated knowledge. Students who use them acquire meaningful, interconnected learning and, as a bonus, ‘learn how to learn’ more effectively. The maps help students to make sense of what they are trying to learn” (Cardellini, 2004, p.1308).

I propose using concept maps for design students not so much as a tool to "learn how to learn," but as a tool of self-inquiry and discovery to explore what inspires them, to combine critical, creative, and conceptual thinking to help them make sense of their inner reflections and ideas. For example, mapping out initial concepts for a new fashion design collection could help students get to the core of what motivates them to create, and I believe students could use the

tools not only for self-inquiry but also as a way to form original ideas through the combination of what may initially seem to be disparate concepts.

Novak defines a concept "as a perceived regularity (or pattern) in events or objects, or records of events or objects, designated by a label. When joined together with appropriate linking words, concepts form statements or propositions describing some aspect of the universe, naturally occurring or constructed by humans" (Cardellini, 2004, p.1304).

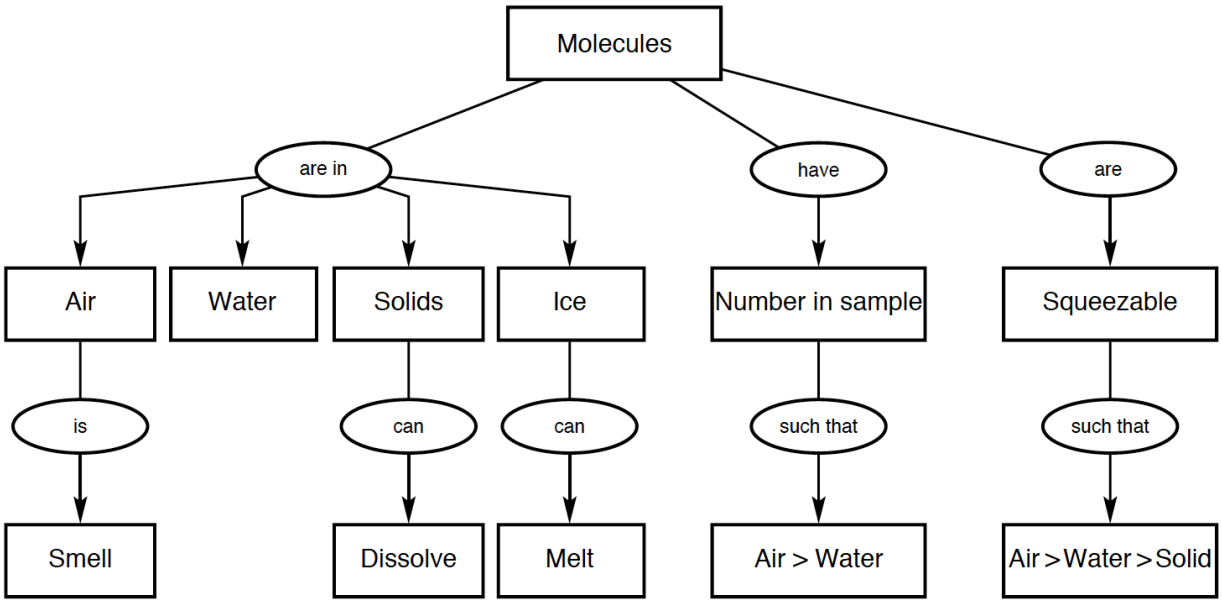
The following quote from Novak explains the general process of concept mapping.

> We have found that it is helpful to begin by identifying a "focus question" to guide us in building a map about some event, text passage, or problem to be resolved. For example, we might ask: What conditions are needed for water to boil? We then identify 15–20 concepts that are pertinent to answering this question (either as an individual or as a team), and rank-order these from most important, most general to least important, most specific. We begin the map with the general concept and then link this to two or three less general concepts with appropriate linking words to form propositions. We proceed to add other concepts and propositions, forming a hierarchy, restructuring the map as we proceed to add clarity and precision to the propositions in our map. Finally we search for "crosslinks" or relationships between concepts in different sections of the map, for the crosslinks may reveal creative insights that can aid in answering the focus question. More concepts and propositions can be added as the map is elaborated and further refined. (Cardellini, 2004, p.1305)

Figure 5 shows a concept map developed from an interview with a 7-year-old girl. The words that link the concepts help provide direction for breaking down further concepts.

Figure 5

Concept map drawn from Dr. Joseph Novak's interview with a seven-year-old girl.



Note. Reprinted from "Conceiving of Concept Maps To Foster Meaningful Learning: An Interview with Joseph D. Novak", by Cardellini, L., 2004, *Journal of Chemical Education, Volume 81, p. 1304*

I see the potential for this conceptual thinking tool to be used in design classrooms as a way to jump-start students' initial direction for their research. The linking words in Figure 5 could be useful in helping a design student break down their ideas for a concept.

I have worked with fashion design seniors on developing concepts that inspire a collection of garments, and many of them struggle coming up with initial directions to explore, or they struggle with how to develop these directions. Concept maps could be useful in getting students to think critically about how their initial ideas for a collection might link to wider concepts. The ability to break down or link concepts, particularly when they initially seem disparate, has the potential to create original ideas with a unique point of view. I imagine this tool could be adapted by replacing or perhaps supplementing the words in a traditional concept

map with visual representations of concepts such as a collage of images or drawings. With images and words joined together by linking words, visual propositions would begin to take shape, perhaps describing some aspect of a student's inspiration. Creating a concept map at the beginning of a project could give students insight into a deeper understanding of their ideas, which benefits both students and the faculty guiding them. Knowing what they understand at the beginning of a project can help clarify and strengthen its future direction. If students can learn to break down ideas into smaller components, then they can more easily connect or associate different concepts. Students creating a concept map can discover what works for them with the map and what does not. They can adopt what works and perhaps keep the framework for future reference. I plan to do further research on concept mapping to see how I might adapt it and design exercises for this to benefit my students.

Tool #7: Visual Thinking Strategies (VTS)

I am presenting Visual Thinking Strategies (VTS) as a tool for consideration in a 3Cs toolbox. I have not yet tested this tool in my classrooms, but it is a tool I am looking forward to working with in the future.

Cognitive psychologist Abigail Housen developed visual Thinking Strategies (VTS) after she published an aesthetic development theory in the 1980s (Smith, 2008). VTS is a tool for developing creative and critical thinking, and it is used worldwide by teachers from a wide variety of disciplines with students of varying ages.

When conducting the VTS method, educators ask students to look quietly at an image for several minutes and then, through prompting, talk about what they see. There are no wrong answers. "To focus the group's attention, teachers point to whatever children talk about, and

paraphrase their comments to elevate articulation, introduce new vocabulary, and convey that they understand and value every response. Teachers link children's comments to deepen the discussion and enable students to learn from one another. Throughout, they are carefully nonjudgmental" (Smith, 2008, para. 8). VTS is a tool that develops reflection, reasoning skills, and helps students deduce meaning. "It's an exciting way to get students talking, observing, making inferences, and backing them up. And it's had a big effect on me as a teacher. I've gone from being the expert, the one who always has the knowledge, to being more of a facilitator" (Smith, 2008, para. 4).

Principal Maite Iturri of El Verano school in CA notes, "VTS builds confidence and community. It enhances language, communication, and inquiry skills," Iturri adds. "It levels the playing field. The teacher accepts and celebrates all the answers the students give. Everyone is a winner" (Smith, 2008, para. 13).

I spoke with Amy Sallen, an art teacher from Boston Public Schools, who uses Visual Thinking Strategies in her K-8 classrooms. She uses the tool as a means to heal the negative effects she sees occurring from digital media overuse by her students. She is concerned about the heavy use of cell phones and gaming that she witnesses among many of her students, and worries that unmonitored or irresponsibly monitored use of games and digital media is producing passive thinkers. In addition to critical thinking skills, Sallen has found that VTS builds social skills and empathy as students learn to listen to one another's ideas, engage in dialogue, and gain perspective. She also observes that, over time, students using VTS develop an improved ability to focus.

Sallen learned to adapt VTS to the specific needs of her students. She notes that her students were initially having difficulty connecting with the material presented in a standard

VTS curriculum. “The curriculum didn’t work for them. Urban middle school kids couldn’t connect with it” (Sallen, A., personal communication, May 9, 2020). However, VTS offers options for choosing images that are relatable to a variety of students. VTS guided her to choose more relevant images for her curriculum.

Harvard University uses VTS with medical students to help improve their observation skills, and I believe it can and probably has already been adapted for college-level art and design classrooms. This critical and creative thinking tool has specific training sessions and guidelines for how to use it, but, like all critical, creative, and conceptual thinking tools, it also has the potential for adaptation. In the future, I plan to learn more about this tool, experiment with it, and perhaps design ways to best adapt it to my courses.

Additional Tools for Future Consideration

The following are additional tools for future investigation, application, and adaptation into a 3Cs toolbox: Dr. Edward de Bono’s Parallel & Lateral Thinking methods such as Six Thinking Hats or the Random Entry Idea Generating Tool (Davis, 2004); Divergent and Convergent Thinking Methods (Davis, 2004); Reflective practice (McIntosh, 2010) and Freewriting (Taylor and Szteiter, 2012). (See Appendix B for the 3Cs toolbox contents.)

Practical Applications for the Toolbox

The goal of the 3Cs toolbox is to provide educators additional ideas and methods for engaging critical, creative, and conceptual thinking with their students, and a menu of 3Cs tools to test within their creative practices. They can choose what works best for them depending upon student behaviors, interests, curriculum, creative processes, creative frameworks already in

place, or preferences. They would then compile a customized toolbox for reference when seeking to improve creative output. The customized toolbox is designed to be an iterative living document that can become a continually adapted and expanded framework.

While primarily designed as a toolbox to aid faculty, students and creative professionals can also utilize the tools, see what works best for them, and then curate and customize the tools that work best for them, their learning, and their style of working.

Faculty seeking to teach their students how to use the tools on their own can demonstrate some of the tools, and provide students with the 3Cs guidebook (see Next Steps section) to help ignite students' curiosity to investigate some of the other tools on their own. However, if several faculty members at one school each test out one or two tools in their classrooms, students may become exposed to a wider variety of tools across their courses, thereby increasing the chances that they will build out a personal toolbox.

I believe that the 3Cs toolbox can improve art and design students' performance in school and as they enter the workforce. Students prepared to meet challenges with tools for generating creative output, which they have tested and felt connected to, can produce more insightful, creative, and challenging work, which raises the bar for everyone.

Art and design students are future creators in our society. An education involving critical, creative, and conceptual thinking is imperative to their livelihood and the progression and sustainment of culture. "Creativity has been marginalized to some extent within formal educational contexts but many have long argued that the development of creative talent is not an educational frill but rather a central issue in the preservation of our culture" (Gowan, 1972; Hennessey & Amabile, 2010; Sternberg & Lubart, 1996, as cited in Hargrove and Nietfeld, 2015, p. 292).

What Others Have Done Before Me

In examining what others have done in the area of tools for promoting creative output within education, I looked at H. Wilson's review of the Creative Problem Solving Kit (Wilson, 2006). The kit contains materials for students and teachers, which draw upon Alex Osborne's Creative Problem Solving (CPS) technique, a method developed as an educational model by Osborne and Parnes in the 1960s, and later built upon by Treffinger and Isaksen as recently as 2005 (Wilson, 2006).

Both the CPS kit and the 3Cs toolbox are geared toward providing resources to teachers who seek to enhance creativity in students. The CPS kit focuses on the improvement of students' creative potential, while the 3Cs toolbox targets the progress of students' creative output. Unlike the current 3Cs toolbox, the CPS kit includes a leader's guide, which is something that will be added later to the 3Cs approach in the form of toolbox usage instructions. Like the 3Cs toolbox, the CPS model offers flexibility in choosing tools that work best depending upon the educational setting, student needs, and faculty needs.

One of the main differences between the CPS model and the 3Cs toolbox is that the CPS model offers tools in the form of a kit, which allows each tool to be used as needed. Conversely, the 3Cs toolbox provides a list of tools, and faculty have the choice use them at face value or adapt the tools as necessary to create a customizable experience as well as a customizable toolbox in the form of a binder or online system that can be referenced and built upon as needed. The CPS model does not offer a way to create a customizable kit or a personalized end product.

The 3Cs toolbox offers tools alongside examples of how tools can be adapted to particular pedagogical needs, encouraging both experimentation and adaptation by faculty. In

contrast, the CPS kit is less creatively flexible in its suggestions for tool use but offers specific lesson plans for ease of implementation into the classroom. The 3Cs toolbox encourages more creative license, experimentation with what works, and flexibility.

Another difference is that the 3Cs toolbox is explicitly targeted toward the creative fields of art and design, geared to benefit art and design students as well as creative professionals, and has been implemented and tested, in part, with undergraduate level art and design students. The CPS model is geared toward teachers working in the field of gifted education, with materials "designed to be used with students of all grade levels and in a variety of content areas" (Wilson, 2006).

While CPS is focused on problem-solving as it relates specifically to creativity, the 3Cs broadens the scope by looking at creative output as the convergence of critical, creative, and conceptual thinking. I perceive each of the 3Cs working symbiotically to feed and foster creative output.

Counter-Arguments and Counter-Counter Arguments

In the time of Covid-19, people are relying upon digital devices to help keep them socially connected to others outside their homes. Digital devices are saving people from feeling completely isolated, keeping them active, teaching them new skills, as well as stimulating them both mentally and emotionally.

Public school children are able to continue receiving their study materials, and many are using learning applications provided by their school to keep up with various subjects. College classes have moved online, and students are able to continue with their learning goals, albeit in a very different way.

The era of COVID-19 has shown the true benefit of digital devices. But it also demonstrates that there is a time and a place for their benefits.

Once there is a vaccine or medication to help with COVID-19, and people begin to venture out of their homes again, they will need to heal in ways that do not involve digital devices. Likely, people will desperately need to reconnect with others, have face to face conversations, give hugs and handshakes, let their children play and interact, and reconnect with the physical world. Perhaps this time will show the true meaning of what was lost and teach everyone to appreciate what they were lacking and what was not appreciated before. Perhaps people wish they had spent more time being present the last time they were with certain friends or family instead of looking at their phones.

When things return to relative normality, and we all get together again, I wonder if we will immediately start checking our phones while conversing in person with others or if we will have gained something from this experience. How long might it take before we go right back to those habits of distractions? More than ever before, young people will need to consider what it means to manage their digital device usage and to prioritize their engagement with the people in their physical presence over digital interactions.

Examination of Digital Tools for Creative Output as a Counter-Argument

Digital technology has made many improvements to the way humans live. However, it is important for students to learn how to take breaks, reflect, experience boredom, and problem-solve without digital technology present.

Although digital distractions can make it difficult for creativity to flourish, digital technology can be used alongside some of the 3Cs tools I have outlined if used in moderation.

For example, one digital tool available to aid creative output is Popplet (Popplet, 2013). This is a mind mapping application in which you can build both text-based and visual mind maps.

Popplet can be accessed on the computer or can be downloaded as a cell phone application. This type of brainstorming can be a useful way to engage GenZ since they rely so heavily on their phones and always have access to them. Popplet provides an easily accessible method of creative brainstorming by allowing students to use it when it is most convenient or when an idea first arises. This method is an alternative way to engage the tech-obsessed and often distracted young minds of GenZ. However, while using Popplet on any digital media device, it must be acknowledged that distractions such as messaging pop-ups and alerts can occur. There could be some potential for using a digital creative thinking tool such as Popplet alongside a tool such as concept-mapping. Or perhaps a digital version of concept mapping would be useful.

Next steps: Evaluation and Sustainment of the 3Cs Toolbox

When comparing creative output and creative processes of students who used elements of the 3Cs toolbox in my classrooms with students in previous years who did not use the toolbox, I observed many improvements in the students with 3Cs exposure. These developments include improvements in idea generation, student interaction and peer feedback, peer-to-peer learning utilizing conceptually-driven ideas, student engagement, and improved classroom evaluations from the students. Based on these observations, I determined that the efforts to integrate components of a 3Cs toolbox were paying off.

My next step in the development of the 3Cs toolbox is to create a 3Cs guidebook as both a PDF and printable book. The guidebook will be an edited version of this paper that is entirely

focused on the tools and how they can be adapted for art and design classrooms in higher education. I would also like to arrange to hold a talk about my synthesis to garner interest in the topic and to provide copies of the guidebook to share with faculty.

I plan to establish a survey link to be included in the guide where faculty can share their initial thoughts on the tools as well as suggestions for how they may adapt the tools to suit their needs. The survey will also include follow up questions regarding how faculty actually used and adapted the tools and collect feedback on the tools' effectiveness as well as suggestions for improvement.

I would eventually like to create a living 3Cs tools document online where any faculty member can add contributions regarding how tools were adapted and their observations regarding the tools' effectiveness for students. Eventually, I would like to survey students who have experienced the tools in their classes to obtain their opinions on effectiveness as well as suggestions for improvement. I see the 3Cs toolbox as an ever-evolving living resource that works in the best interest of faculty and students. After I have tested this model within the faculty at MassArt, I would eventually like to share the guidebook with a broader audience of educators and adapt the tools for use in the K-12 system, as well as test how it might work for creative professionals. I imagine there could be several iterations of the guidebook where the needs of the users shape the tools.

I believe that 3Cs synergy is the key to producing higher creative output. First-hand experience working with my students has lent me insight into forming this model. However, further examination of the 3Cs relationship is needed to substantiate this theory and deepen understanding of how these three components work symbiotically to produce higher creative output.

Conclusion

Creative output is not fixed. It can be developed and strengthened with practice, time, and the right tools. While digital distractions can hamper an individual's ability to perform the kind of deeper level thinking needed for creative problem solving and creative output, there are tools that can help a person focus on the present and delve deeper into their creative work. I hope that the critical, creative, and conceptual thinking tools outlined in this paper may be of some use to educators, students, and creative professionals.

Like other educators during the Covid-19 pandemic, I learned to quickly adapt my classes to an online teaching format. Recently, during one of my online classes, a loud notification sounded while one of my fashion design seniors presented a project she had worked on for months. She winced and stopped her presentation to search for a way to shut off the sound. She could not figure it out, so she continued with her presentation. The notification sounded again and again, and each time she stopped to complain about her frustration with it. Other students offered advice about how to shut it off, but no one could figure it out. I directed her to ignore it and continue, but the visible exasperation resumed throughout her presentation. Her project was impressive, but her distraction was evident in the communication of her ideas.

This made me wonder what it would be like if she could shut off the notification sounds. She did not seem to care much about the visible pop-ups she was also experiencing. She was only concerned about the obvious sounds the whole class could hear. If the sound was off, she would still see the notifications and likely be distracted by them, but as her audience, we may or may not realize that her attention was diverted. I wondered how that, too, might affect her presentation skills, or her ability to communicate ideas.

The recent global pandemic has demonstrated that our reliance on digital technology is undeniable. Students would not be able to attend school without it, many businesses are able to keep operating because of it, doctors are seeing patients virtually, and I was able to present my capstone synthesis virtually because of it. As we embrace and celebrate digital technology during this time of digital immersion, it is more important than ever that students (and the rest of us) learn when to step away, engage in the physical world, take a break, allow their minds to wander, and invite the states of mind necessary for feeding creative output. The livelihood of art and design students and the future of creativity and innovation depend on it.

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Appendix A

Mind Wandering Survey Questions and Responses

Q1: Do you think the activity produced more creative results or helped with problem-solving?

A: "I think it gave my mind space to think without feeling pressured to come up with ideas."

A: "Yes the exercise made me plan what I should work on first and build off of. It also made me develop my idea of the silhouette more."

A: "I think the 10 minutes really gave me time to sit down and think about it instead of jumping in without a plan."

A: Yes, it is because it's kind of nice that I have 5 min to relax my brain to think what should I do next."

A: "The activity helped with problem solving by how I would implement putting the material onto dress form. The amount of stretch and pull I applied to the plushie toy helped me visualize it as being a trash bag as I continue to shape it."

A: "I'm not sure. I think weirdly enough the exercise gave my brain room to breathe."

A: "Yes because I stepped away from the piece and thought about the big picture instead of the details."

Q2: Did anything surprise you about this exercise?*

*Note: For the second question, I omitted the comments of students that indicated they did not understand the question.

A: "It was surprising how hard it was the just let my mind wander."

A: "I didn't think about my project I was doing in class."

A: "I was waiting to get back to work since I came up with a few more ideas during the 5min break."

A: "One thing that surprised me was how shaping the dress form with trash bags felt similar to shaping the plushie toy by putting it under stress." This comment suggests the student did not understand that the question should be applied to the mind wandering exercise. However, their answer demonstrates that they took part of the experience from the mind-wandering exercise (manipulation of the stress toy) and related it to their project (similar manipulation of the trash bags).

Q3: Did you learn or take anything away from this experience (good or bad)?*

*Note: For the third question, I omitted comments from students whose answers indicated that they did not understand what the question was referring to.

A: "I learned that there is so much space to think if you allow yourself the time

A: "It's always helpful to step away from the piece of art you're making because when you come back you have a clearer mind."

A: "I learned that taking a short break is helpful for me since once I start working I find it hard to stop."

A: "I learned that it is important to take a minute to think and plan out."

A: "I took this activity as a good experience as it helped me thought about the project by whatever movements I previously made to the plushie toy."

A: "To step away from my project now and then to see the bigger picture."

Appendix B

3Cs Toolbox Contents

1. Mind-Wandering
2. Plus/delta feedback
3. SCAMPER
4. RAD LIBS
5. Metacognition
6. Concept Mapping
7. Visual Thinking Strategies (VTS)
8. Parallel & Lateral Thinking methods such as Six Thinking Hats or the Random Entry Idea Generating Tool
9. Divergent and Convergent Thinking Methods
10. Reflective practice and Freewriting