For 5 years, I had informally used Design Thinking and other metacognitive tools to help the students in my AP 2-D Design Art Studio grow. I believed that this focus led to increased engagement in my students, and artwork that showed a deeper level of creativity and thought. However, I had not directly taught them Design Thinking or the Design Process. I led them through the steps of the process but did not name them. According to Vande Zande (2007), understanding the Design Process can help students become stronger critical thinkers. With this in mind, I decided to undertake an observational case study in which I focused directly on Design Thinking and addressed it more intentionally in my teaching. My hope was to understand how students saw Design Thinking and to ascertain whether they found it relevant to their lives both within and outside of the art room. My interest in student perception was influenced by phenomenological studies. Rossman & Rallis (2012) describe phenomenological studies as “open-ended, searching for the themes of meaning in participants’ lives” (p. 311). I discovered that Design Thinking strengthened my students’ critical and creative thinking during both practical and expressive problem solving. Design Thinking has a valuable role within art education and as a bridge to nonarts subjects. It fosters skills that are integral to many aspects of students’ lives.

**Background**

The semiurban public high school where I teach art and design has a student body that is diverse and predominately low-income. In the AP 2-D Design Art Studio class, students choose their media and techniques. As the instructor, I review with them the elements and principles of design and coach them through the process of developing a personal voice in their artwork. Central to the course is the development of a concentration in the students’ artwork. The College Board (2013) defines this as “a body of work unified by an underlying idea that has visual coherence” (p. 6).

I constructed my study around the development of my students’ concentrations. I walked them through the Design Process and other aspects of Design Thinking, such as backwards design and empathic design. I introduced my students to artists, designers, and inventors who used Design Thinking in their work and showed TED Talks in which they explained how they used the process. My students were particularly inspired by Richard Turere: My Invention That Made Peace With Lions (Turere, 2013), Tim Brown: Designers: Think Big! (Brown, 2009), and David Kelley: How to Build Your Creative Confidence (Kelley, 2012). I conducted several classroom discussions and in-depth interviews with three of the most passionate and outspoken students to better understand their perceptions and give them a voice in the greater dialogue surrounding Design Thinking.

It is the student voice that I find most necessary and all-too-often absent from this discussion. If we want to assess whether teaching cognitive processes such as Design Thinking explicitly impacts our students’...
understanding, we need to hear the students’ perspectives. We need to understand how they use these thinking processes in their lives now and how they plan to use them in the future. If our students do not find relevance in Design Thinking, teaching it is of little value.

Students
To better understand the observations of the three students I interviewed, it is valuable to know a bit about them. Forrest is a White male from a middle-class family. He had previously taken multiple courses with me. Forrest has a deep love of making art, especially animation, and his work had been recognized in several major competitions. His artwork almost always showcases his zany sense of humor; he has developed a quirky style that is easily identifiable to anyone with even a passing familiarity with his work. Tiffany is an African American female from a working-class family. She had little formal training in art before her junior year, but her self-taught drawing skills and passion for creating led me to approve her to skip several course prerequisites to enter into our most advanced art class. In addition to school, Tiffany worked full-time at a local grocery market to help her family after her father lost his job. While dedicated and responsible, she often had trouble focusing in class due to fatigue. Santiago is a Latino male and a first-generation immigrant to the United States, from a low-income family. Santiago had taken two art courses with me over the previous years. While he enjoys art, Santiago is primarily interested in computers and building functional, often-mechanical objects. These students’ insights expanded my thoughts on design and Design Thinking.

Design Thinking and Problem Solving
Vande Zande (2011) explains that “the word design is both a verb and a noun” (p. 28). We make designs, and the cognitive activities we use to make them are referred to as Design Thinking (Visser, 2006). Central to these activities is the Design Process. All three of the students I interviewed described the Design Process as a way to solve problems. In fact, both Forrest and Tiffany defined Design Thinking as a method of problem solving. The students all found this form of problem solving very relevant in their art classes; however, it is not unique to art. Santiago discussed how he used the Design Process in his engineering class with some slight changes to how problems were approached. Tiffany echoed Trilling & Fadel (2009) by drawing parallels between the Design Process and the scientific experimental method (p. 92).

There are dozens of versions of the Design Process. With my students, I used the STEM Fab Studio Design Process developed by Nick DiGiorgio for FabLab and the Cleveland City Public Schools in 2012 (Figure 1). The steps of this process are Ask, Imagine, Design, Build, Evaluate, Refine, and Share. I will explain these steps with the assistance of the voices of my students.

Figure 1. The STEM Fab Studio Design Process developed by Nick DiGiorgio for FabLab and the Cleveland City Public Schools in 2012.
Santiago explained that Ask describes the stating of the problem, but that sometimes the problem is not apparent; rather, the teacher “gives us a concept and constraints so we have to sort of come up with the problem.” To help my students start their artwork, I often gave them a topic or a one-word prompt to consider. The students indicated that both in art and in life, sometimes problems are too ambiguous to easily state. Thus, Ask can be making sense of a problem. Forrest used Ask to set up the comedic premise of his artworks. Tiffany discussed making artwork for a friend and using Ask to think about what her friend would appreciate in it. In the artworks pictured here, Forrest is responding to the prompt Ritual and Tiffany is responding to the prompt Loss. In addition, the students were constrained by the need to create the piece with Photoshop, a tight schedule, and a need to address narrative in their piece. Otherwise, this project focused on facilitating the creation of student-generated artwork.

Santiago explained that Imagine describes the ideation of multiple solutions and might involve research or mind mapping. Tiffany used Imagine to come up with multiple variations to a solution; sometimes these were variations in the pose of a drawn figure or central theme behind the narrative arc of a comic strip (Figure 2). Forrest thought of Imagine as the primary creative step of Design Thinking, where he tried out different ideas and added a little twist to add a surreal element to his work. My students often utilized word webs and mind maps to help generate ideas and make connections. In a later classroom discussion, Forrest indicated that he felt the making of unexpected connections through his mind maps was an important component to developing the humor in his work (Figure 3).
DESIGN
Tiffany explained that Design describes the step where you use sketches or storyboards to envision your solution (Figure 4). Santiago elaborated that this allows you to more closely explore your best solutions to the problem. Forrest related Design to visually communicating the ideas that he generated in Imagine (Figure 5).

BUILD
Forrest explained that Build describes the step where you take your ideas and create the solution by using media or technical approaches to making. Santiago described using Build in an engineering class as prototyping. I am not sure that this parallel is completely accurate, as prototypes closely resemble a sculptor's maquette, which more closely aligns with the Design step. Tiffany often used her favorite sketch and built it up with layers of media or scanned it and drew on top of it.

EVALUATE
Santiago explained that Evaluate describes the step where you initially share your work with others, often through a formal critique. Forrest used Evaluate to make sure he communicated his ideas and could make the audience laugh. Tiffany used it to see if her work was improving and moving in interesting directions. Santiago also pointed out that in art we often use Evaluate before we Build our solution. This may relate to his insight on prototyping, or it may indicate that this particular version of the Design Process does not perfectly align with my instruction.

REFINE
Forrest explained that Refine describes the step where you respond to Evaluate. This is where he would tweak the joke if someone did not laugh. Tiffany used Refine to clean up her artwork and sometimes also to start over and come up with a better idea. This is an important aspect of the Design Process and is intentionally addressed in this version. As Nick DiGiorgio explained, “I really wanted to make it clear that design is iterative and that you have to use trial and error to come up with the best solution. I added the inner circle of the cycle to address this” (personal communication, May 28, 2014).

The students indicated that both in art and in life, sometimes problems are too ambiguous to easily state.
Santiago explained that Share describes the step where the finished work is displayed or presented for others to see, usually as some sort of exhibition. Tiffany disclosed that she sometimes made tee-shirts from her artwork and wears them around town. For her response to the prompt Loss, Tiffany displayed her five-page comic, “Scream for Ice Cream.” In our school, and she hopes to publish it in an upcoming comic anthology (Figure 6). Forrest pointed out that Share is a final version of Evaluate, after you have decided the work no longer needs refinement. As an educator, this brought to my mind the difference between formative and summative assessment (Figure 7).

Formalizing the Process

Although they did not use these words, both Tiffany and Forrest claimed that Design Thinking formalizes an informal process that is already a part of art. Vande Zande (2011) explains, “We all design naturally when we make decisions about what to wear, how to personalize our living spaces, or how to fashion our appearance” (p. 27). In Forrest’s words, Design Thinking was always a part of his art experience, but “before we introduced all of the names for design thinking, it was a thing you did in the back of your head.” He elaborated:

When you actually learn about the terms and the thinking behind it, you know more what to do, and if you get stuck you can go back to the steps. So, it helps guide whatever work you are doing to help move in the right direction.

Tiffany echoed this concept when she said, “In the past, I guess I used it a bit in my other art classes, but I never had a name for it, and if I had trouble, I didn’t have a way to work through it.” Santiago concurred that Design Thinking gave him a way to intentionally work through getting stuck. All of my participants agreed that having this formal or intentional process helped them produce better ideas and kept them going when they got stuck in the problem-solving process.

Tiffany and Santiago both revealed that formalizing the process allowed them to solve larger and more complex problems. In the art room, they agreed that Design Thinking was more useful than other activities for projects that required original thought. My students found this aspect of Design Thinking even more useful outside the art room. Tiffany used Design Thinking at work to raise $13,000 for a breast cancer charity. She believed that she would have given up on the project if she did not have the Design Process to fall back on when she got stuck. Santiago indicated that Design Thinking gave him confidence to build a go-kart and other complex projects at home.
21st Century Skills and Creative Industries

All three students made connections between Design Thinking and creativity. Creativity, an intrinsically holistic trait—and, according to Zimmerman (2009), inclusive of behavioral aspects such as personal motivation, emotional reaction, cognitive complexity, and technical ability—is now seen as one of the most important skills for business leaders (IBM Global Business Services, 2012). Creativity is a cornerstone of the 21st Century Skills movement, which seeks to reframe education on the needs of the emerging innovation economy. Trilling and Fadel (2009) identified the key learning and innovation skills of the 21st Century Skills movement as (1) critical thinking and problem solving, (2) communication and collaboration, and (3) creativity and innovation.

Throughout my interviews, the participants discussed the relationship between Design Thinking and the 21st Century Skills. Trilling and Fadel noted that “these skills are the keys to unlocking a lifetime of learning and creative work” (p. 49). Both problem solving and creativity were identified by my students as the core of Design Thinking. Communication was frequently mentioned by Forrest, who said, “trying to get a joke across or trying to get an idea through the artwork is kind of how I use it [Design Thinking] most of the time.” Forrest later mentioned the importance of Design Thinking to collaboration when he said: “Animations are usually so big and complex and require so many people that you need Design Thinking to get everyone going in the same direction to get it all done.” Santiago echoed this sentiment: “If I’m designing an engine, or a computer chip, or robot, whatever, I’ll be working with a team figuring out how to solve problems with technology.” The relevance of Design Thinking to the 21st Century Skills movement was recognized by Trilling and Fadel when they claimed that “learning to design and designing to learn… will prepare students for the demands of the Innovation Age” (p. 107).

Authors such as Pink (2005), Florida (2002), and Gardner (2006), as well as business leaders including Robert Lutz and the late Steve Jobs, saw creative thinking as one of the key skills for the 21st-century economy. The United Kingdom’s Department of Culture, Media, and Sport (2001) defined these emerging creative industries as ones “which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property” (p. 4). It is difficult to measure the impact of the creative industries, but the Department of Culture, Media, and Sport estimated that in 2000 they accounted for over 1 million jobs and £112.5 billion in earnings for the United Kingdom’s economy alone. This figure would clearly be much higher in the US, but the Bureau of Labor Statistics does not measure data under creative industries as a distinct category. Both Forrest and Tiffany expressed interest in pursuing a career in the creative industries. Forrest was most interested in working as an animator, but was also interested in film and Web design. Tiffany was less specific about her interests, but mentioned marketing and communications. Both students saw Design Thinking as critical for their chosen fields.

Cross-Disciplinary Design Thinking

While my students understood Design Thinking as a process for general problem solving, they also saw it as an important part of art specifically and as nurturing to creative thinking intrinsically. Seidel, Trishman, Winner, Hetland, and Palmer (2009) claimed that one of the primary purposes of art education is the fostering of broad dispositions, including creative thinking and making connections. When looking at the transfer of learning from art education to other subjects, Hetland and Winner (2004) advocated for educators to...
focus on the bridges between the disciplines, such as critical thinking and creativity. When we compare the themes of Design Thinking to the purposes of art education and the bridges between art education and the other disciplines, it becomes apparent that Design Thinking has an important role within art education and may have an even greater role in connecting art education to a larger integrated curriculum.

Trilling and Fadel (2009) explained that the integration of art and design into STEM to create STEAM should be an important goal of education for the coming innovation economy. This—combined with Bullitt and Bullitt’s (2012) suggestion that Design Thinking’s unique relationship with engineering and the sciences could support further integration between science and the Arts—suggests that Design Thinking has an important role as a bridge within STEAM education. However, we must remember that neither Design Thinking nor STEAM education should replace art education. We cannot ignore Heitland and Winner’s (2004) warning that “arts programs should never be justified primarily on what the arts can do for other subjects” (p. 136).

**Conclusion**

I have noticed an obvious unease when I talk with some progressive art educators about Design Thinking. I believe that they, understandably, worry that a focus on design will take art education back to its 19th-century roots of the Massachusetts Drawing Act and to serving industry by teaching manual skills. I hear their fears reflected in the voices of my students Inez and Elizabeth, who were at first uncomfortable thinking of art as problem solving. However, when I listen to the rest of my students, I do not hear them speaking about Design Thinking only for their future careers or to solve problems. I hear them talking about using Design Thinking to make sense of ambiguity, to empathize with others, to think creatively, to communicate ideas, to collaborate, and to make people laugh. In describing the goals of holistic art educators, London (2004) wrote: “Our ultimate ambition is to elevate behavior to the degree that the whole and integrated person appears the necessary precursor of the whole and integrated society” (p. 2). Today, the needs of industry closely align with the goals of holistic art education. Tomorrow, our creative and integrated students may change industry and its role in society.

**Author Notes**

All images used with permission.

The research for this article was conducted as part of the author’s Master of Arts in Art Education degree from the Maryland Institute College of Art (MICA).

Thanks are extended to MAAE faculty who facilitated the design, implementation, and reporting of this research.

---

**REFERENCES**


FabLab. (2012). The STEM Fab Studio design process. [N. DiGiorgio, Instructor], Cleveland, OH.


