Chapter #13

LEARNING TO DESIGN DURING PRE-SERVICE EDUCATION

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ABSTRACT
This chapter examines design thinking as a pedagogical tool to support the learning of pre-service teachers and human services professionals. Over the course of a 10-week period fourteen pre-professionals completed design projects that involved working with children/youth, teachers, families and/or community members with the goal of arriving at meaningful and creative solutions to challenging educational and/or community-based issues. Pre-professionals learned and practiced four stages of the design process that included learning how to empathize, define, ideate, and prototype. Participants documented their progress in hand-written and hand-drawn sketch books and they also completed online surveys and semi-structured interviews. The chapter focuses on two descriptive case examples, considering affordances and barriers to prototype development while one pre-service teacher designed the prototype for an online writing game and a pre-service human services professional developed the prototype for a substance abuse learning game. Findings from this exploratory work offer suggestions for future research and the re-vision of pre-professional education in ways that incorporate design practices.

Keywords: empathy, design thinking, creativity, pre-service learning.

1. INTRODUCTION

The study of improvisation and creativity has a long history in pre-service education and professional practice (Darling, Erickson, & Clarke, 2007; Hanley & Fenton, 2007; Steitzer, 2011). However, it is only recently that design practice has been considered within teaching and the human services professions. Some conceptual writing, for example, describes how teaching involves "design work" (Jordan, 2016; Kirschner, 2015) and how design practices are implemented in the classroom (Retna, 2016). Additionally, global design company, IDEO, has developed an extensive set of resources to support teachers as they work in schools to solve design challenges. Yet, few researchers have examined how the process of design thinking might be incorporated into pre-service education. Jordan (2016) suggests that pre-service teachers need to develop habits of thinking and problem solving that allow for flexibility and alternative solutions offering design thinking as a possible avenue for learning these skills. In practice, pre-service education emphasizes development of *planning* skills since the focus is on meeting standards and learning outcomes. As Retna (2016) notes, however, "There is a lack of empirical research on the adoption and implementation of the design thinking process in educational contexts from the teachers' point of view" (p. 5). While these kinds of conversations are just beginning within teacher education, they are not yet part of the lexicon in the human services professions where traditional program planning and evaluation skills have never been situated within the design field.

Learning to design is important in pre-professional education because this work hinges on a professional's ability to empathize with students and/or clients, setting aside professional biases to gain a deep understanding of student and client needs. When designing, professionals engage in empathy through active listening and observation skills. By immersing themselves in a student or client's experiences pre-professionals gain insights into needs and feelings in order to design activities, products and educational experiences that genuinely meet student and client needs.

The purpose of the project described here was to introduce pre-service students to design processes, offering support as they learn to confidently use tools to empathically connect with children/youth, families and community members to meet emergent needs and create their own unique programs and products. What happens when pre-service teachers and human services professionals engage with one another in design thinking while creating solutions with and for students, classrooms, families and communities? The project described here is an exploratory study with the aim of examining student's involvement in the design process through the first four of five design stages (empathize, define, ideate, prototype):

1. *Empathize*: Observe, engage, watch and listen to children, teacher, etc... who are expressing a need
2. *Define*: Bring clarity to what was learned through empathy, arriving at a point of view (project scope)
3. *Ideate*: Begin creating solutions through brainstorming
4. *Prototype*: Generate artifacts that move closer to a final solution
5. *Test*: Test the prototypes by obtaining feedback from users (iterate: by using feedback for revisions)

This research takes an exploratory and qualitative approach to examining how pre-professional students move through the design process, how they engage in empathic design within a school or community, and how they view the value of this work and their learning from inception through to completion.

2. METHOD

Fourteen students enrolled in a quarter-long (10-week) online experimental course on "creative change" participated in this project. Twelve of the participants were female and all were enrolled in pre-professional programs with the goal of becoming k-12 teachers or human services professionals (e.g., working in the foster care system, homeless services, chemical dependency, faith-based services or rehabilitation counseling). The age of respondents ranged from 20 to 31 years, with an average age of 23.7 years. The purpose of the course was to learn about creative change and social innovation designed to support schools, families and communities. Learning outcomes included the following:

- Learn and practice design thinking principles used in education, business, government and non-profit sectors.
- Examine the tools and processes associated with social innovation and creative change including sketching, mapping, digital storytelling and the use of free web-based software.
- Explore and participate in contemporary creative change movements including makerspaces, public and social labs, and global challenges.
- Analyze the application of game design thinking to health, education and human services.

Each student's final course project involved developing a product prototype related to their interest or field of study: human services, education, health or the environment. The product could be a service, game, software app. or something else of their choosing. Students learned and practiced the central stages of the design process including how to empathize, define, ideate, and prototype. No constraints were placed on the type of product to be produced.[1] Early on in the process students were required to meet with potential end-users of their product to help identify needs and gaps in services.

All of the participants identified a target population and then initially met with members of this population: youth, families, and other community members to understand needs and to learn about the types of products and services that would be useful. They then created empathy maps in the form of visual summaries of these conversations, describing what the users said, did, thought and felt. Completed empathy maps were used to suggest the scope of their projects and key elements of the prototype. Students were also required to develop a Point of View – a guiding statement focusing on information uncovered during conversations with users about their needs and their insights into these needs. Using sketch books participants regularly shared their progress related to each of the design stages with each other, receiving feedback from peers and the instructor over the 10-week period.

Pre-service students completed open-ended online survey and semi-structured interviews. All participants gave permission for their responses, process "sketch books" and prototypes to be shared for the purpose of future course development and research/dissemination. Survey data (collected mid-course) and interview questions (taking place after the end of the course) focused on the following:

- How participants arrived at a project idea and how the project evolved over the course of the quarter.
- What factors or processes helped participants complete the project.
- What kinds of roadblocks and/or barriers stalled progress. How participants overcame these barriers.
- How participants moved through boredom and failure.
- How learning from this design project might transfer to personal and/or professional life.

3. FINDINGS AND CASE EXAMPLES

All of the participants successfully completed the design process, from initial meetings with "clients" to develop empathy maps through to a final product prototype. Due to time constraints prototypes were not able to be thoroughly tested and refined, though three of the participants continued to develop and use their products after the course concluded.

Projects varied from products such as the design of a prototype vending machine for homeless people to games to teach about substance abuse and the apartment rental process, a game to support creative writing and another to help students handle failure in a positive way. Other participants designed services such as "Dive and Drive" to pick-up and re-distribute clothing and an interactive website to help convicted felons network in the community and gain employment after being released from prison.

[1] Due to the 10-week time constraint, students engaged in the first four design stages. However, they were unable to participate in the fifth stage involving testing and iteration of their designs.

3.1. Embracing challenge and failures and finding success

Analysis of themes emerging from semi-structured interviews revealed that one of the biggest challenges that students reported experiencing during the design process involved how to move from the idea to prototype. All participants noted that creating a prototype consumed significant amounts of energy. In some instances, students completely changed their products. As one student reported midway through the course, "I've decided to change course completely on my *creative change* project. Not for lack of passion or motivation, but simply because something else literally fell into my lap." Other students were not satisfied with the requirement to develop a basic prototype. They felt responsibility to the people they interviewed when developing the initial empathy map and were determined to create an operational product by the end of the course. One student noted, "I was up all night researching how to make a (software) app., and it's really not as easy as I thought it would've been. Because she wanted her product up and running by the end of the quarter she decided, "Instead of creating an app from scratch (which from what I can see takes programming skills) I am going to modify an already existing app to fit the users' needs."

To illustrate student experiences working on this design project, two case examples are highlighted, the development of a prototype for an online game for school-based students and teachers called "Open Door" and the prototype for a substance abuse treatment game for use by chemical dependency teachers and counselors and youth outside the context of formal schooling.

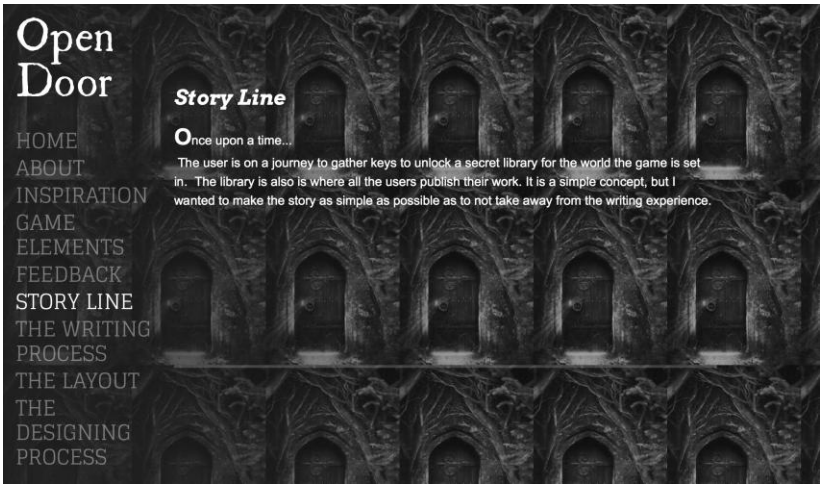
3.2. Open door

Not all students were deterred from creating products beyond their technical abilities. "Tara" expanded her original idea by creating a prototype for *Open Door*, an online writing tool and video game for use by students and teachers,

> My ideas for a writing website have expanded. I still want to do a writing website, but I want it to have a video game feel. The users make an avatar and the writing process is explored through a story line with the user's avatar. Needless to say, this is waaaaaaaay above my skill level and my proto-type will look nothing like my visions.

Despite initial concerns about her technical skill level, Tara did create a robust interactive online prototype (Figure 1). The premise of the writing game is the user is on a journey to gather keys to unlock a secret library. The library is also where the user's stories are published. The prototype calls for "cut scenes" or short instructional videos between each step in the writing process to help authors further their storylines.

Figure 1.
Open door prototype.



Tara said that she envisioned *Open Door* as being a tool to help teachers inspire and motivate students to enjoy writing in the classroom, for homework and for making it easy for teachers to access student's writing. She also viewed *Open Door* as being played for fun by kids and their friends noting, "I want the game to inspire creativity."

Recalling the design process Tara remarked that she started by writing ideas and doodling in her sketchbook. She said that the more she used her sketchbook the more ideas came to her and those ideas continued to grow and evolve. Tara ended her sketchbook with an empathy map noting, "It seems a little backward, but toward the end of my brain storming is when I knew who I wanted to reach." After completing the empathy map Tara continued to research existing products and was surprised to find that the types of free writing games currently on the web were very different from the product she imagined. Tara concluded the course realizing that she had a passion for creating educational video/computer games, but she was also fully aware that, as a student, she needed to put development of *Open Door* on the backburner with the hope of one day taking the plunge to identify start-up funding to make the project a reality.

3.3. Substance abuse education game

A second case example highlighted here focuses on the development of a substance abuse education game designed with and for youth and their teachers and counselors. "Gwen", a pre-service teacher hoping to work with students in alternative education settings after graduation, met with a group of teens in a substance abuse treatment program early in the quarter to find out more about their interests and needs. During these initial conversations Gwen learned that even though each of these youth were using drugs and alcohol, they were indiscriminate users who did not have an understanding of what these substances were comprised of or what they were doing to their bodies and brains. The youth also felt that school teachers, staff and counselors should have better understanding of substance use and abuse by teens. Gwen initially created an empathy map outlining what these teens (potential users of her product) thought and felt about the value of a substance abuse education game. She describes the process:

> We brainstormed ideas – should I create an app? No, we decided that in a group setting and a confidential venue an app wouldn't work. Cell phones aren't even allowed because they all have recording devices - both audio and video which violates Federal Confidentiality Law 42 CFR – regarding drug and alcohol information protection. How can we expect anyone (especially teenagers) to become vulnerable, open and share themselves when there is a chance they may be recorded and have their information go viral in seconds? So we decided on a board game. While rudimentary, it is interactive and fun for all. The goal is to learn, not to win.

While initially excited by the prospect of developing this substance education board game, midway through the project Gwen began to voice fears and grappled with the possibility of failure, recognizing that she would need the teens' feedback through the whole prototype development process:

> I have a fear of being wrong and not being 'perfect'. So I become frozen in time - trying to figure out what in the world I'm going to do. Being willing to make mistakes is key in this project. I am going to just do what I know - I know the information to teach adolescents regarding drugs and alcohol - I will find a way to make it fun, with the collaboration of youth. They know what is fun to them. The empathy map was so helpful to me in this regard! I'm leaning towards a board game with prizes for correct answers - they land on a certain color and draw a card - which will have a question regarding drug/alcohol education. If they get it right, they get a prize. Something to that effect. I'm willing to make mistakes

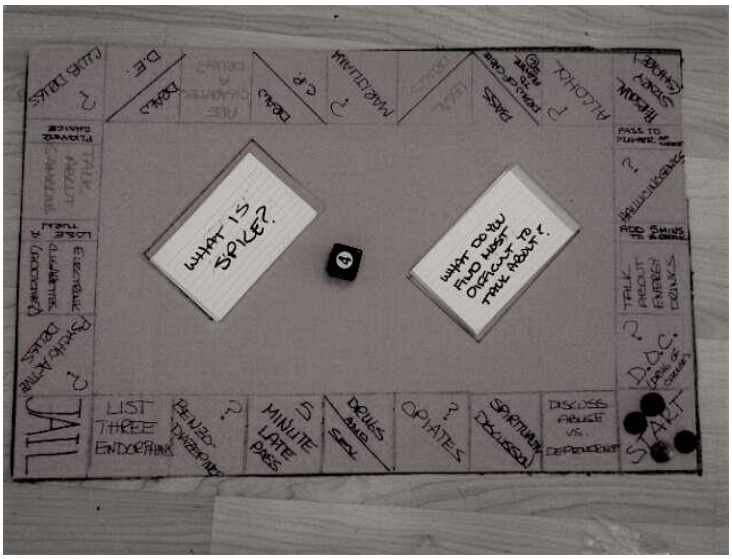
During the design process Gwen never lost sight of her initial discussions with youth. She noted that youth in chemical dependency programs are often there "begrudgingly motivated by outside influences." Thus, Gwen's goal was to create a game that was educational, fun and meaningful for this group of users. When reflecting on the design process at the end of the course she emphasized that there were many obstacles to overcome at the beginning of this project, the first being that she didn't have faith in her own ability to be creative,

> Learning that perfection isn't a reality and that mistakes are opportunities to learn was a great achievement for me. So I began to allow myself to let down my guard and be willing to be childish. I learned to have fun. As a teacher how can I teach fun if I can't have it myself? My project at this time is by no means a finished product. It is a prototype with which I am determined to streamline and improve. Ultimately I would like to patent and market this product.

When reflecting on her final prototype (figure 2) Gwen concluded,

> I hope that teens will learn something that will save them from additional agony in the future. Growing up is hard enough in itself, without being dependent on substances. I want to make a difference in a child's life. I hope that someday he or she will have a talk with their own child and say 'I once had a teacher and she taught me about substance abuse. Let me show you this game I have' That would be amazing.

Figure 2.
Substance abuse education game prototype.



4. FUTURE RESEARCH DIRECTIONS

Professional success requires solid understanding of the diverse interests, strengths and needs of the children/youth, families and communities where teachers and human services professionals work. Thus, experiences that support the development of empathy can be important in pre-service education. Traditionally, in higher education this goal has been met, in part, through service learning and other types of civic engagement projects taking place outside the classroom. The work presented here extends the conclusions of Retna (2016) and Jordan (2016) who suggest but do not examine how design can be be a valuable tool for classroom teachers and pre-professionals. The research presented here provides examples of how design thinking can be implemented in pre-service education for both future teachers and human services professionals. These types of experiences offer pre-professional teachers and human services professionals opportunities to empathically engage in the design process alongside end-users, be they children/youth, families, co-workers or community members who will benefit from their work.

The early-stage research presented here offers some findings regarding how pre-service professionals engage in the design process. What is missing, however, is a clear understanding of how empathy develops between future professionals and students, families and/or community-based clients. How might conversations designed to support the development of empathy maps contribute to prototype development, and how might the experience of participating in a design thinking course as a pre-professional contribute to later professional practice? Finally, how might the original inter-professional intent of inviting both pre-service teachers and pre-service human services professionals to co-enroll in this course contribute to a shared understanding of each other's work? While pre-service teachers and human services professionals were co-enrolled in this course, projects were individual. Future coursework and accompanying research might focus on inter-professional group projects where future teachers and human services professionals are able to work together with the goal of understanding each other's professional work and student/client needs.

From a design standpoint this project speaks to new developments in the ways that pre-professionals learn to listen and to co-create with others to improve and enhance education and services. It also helps us consider processes for developing and implementing ideas as well as learning how to address failure. One student, "Sal", noted that his greatest challenge in the course was breaking out of linear ways of thinking by learning to sketch out his ideas. "In the beginning I struggled to do this, and I would give up and then just go back to writing out some notes, and this felt like a failure in this project." It seems that later when he was able to document all of his ideas without "filtering out" possible solutions, Sal was finally able to succeed in designing the program he had hoped for. "It took being ok with my sketch not being perfect or organized and being ok with the potential for failure." Clearly, additional research exploring how the design process unfolds in pre-services education is necessary.

5. CONCLUSION/DISCUSSION

The inspiration for the work described here emerged from a desire to support pre-service professionals to become agents of change in schools and communities. Likewise, involvement in the design process in a way that encourages children/youth, families and communities to play a role in shaping their own engagement with professionals in schools and community-based agencies was also important. There is a historical tendency for new teachers and human services professionals to draw on pre-planned programs and pre-existing lessons and curriculum packages. However, the goal here was to introduce pre-service students to design processes and support them as they learn to confidently use tools to empathically connect with children/youth, families and community members to meet emergent needs and create their own unique programs and products.

While the course described here required students to create a prototype, the basic building blocks of empathy, design thinking and the willingness to risk failure can be used in a wide variety of professional situations and are consistent with seminal pedagogical theories of Dewey (196), Vygotsky (1986) and Freire (2000) that support teachers, students, families and communities as design agents. As one student concludes,

> Design thinking makes the impossible possible – there are no limits to brainstorming and day dreaming. The limitations come when you get to the prototyping, but then you problem solve through or around those limitations. Overall, I think exploring design thinking reminded me that there are no limits to what I can do and create. It took down the boundaries that I have created going through the busyness and craziness of professional life. We can do great things through design.

Problem solving through and around limitations is at the heart of design thinking and is an important element of professional work that is not always emphasized in pre-professional education. Yet, finding time and opportunities for pre-service students to engage in this type of work is not easy. Design is a messy process and relies on a skillset that has not traditionally been privileged in education and human services, raising questions about how this type of learning can be sustained in pre-service education. Yet the need remains for pre-service professionals to enter the field with a robust set of tools that they can use to connect empathically to solve problems, design programs and tackle future challenges that arise during their careers.

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Short biographical sketch: Jacquelyn Baker Sennett is professor of human services in the Department of Health and Community Studies in Woodring College of Education, Western Washington University. She completed her PhD at Cornell University in human development with an emphasis on ecological systems and cognition. For the past two decades she has worked with pre-service professionals, masters and doctoral level students in the United States and Canada, focusing on creativity as a socio-cultural process and investigating how the creative process is facilitated and constrained in real world settings. Current research looks at design thinking in pre-service education and inter-professional practice to support "layered learning" in schools and communities.