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The Thinking Effects of
Allowing Exploration Time in the Classroom

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A capstone project submitted in partial fulfillment of the requirements for the degree of

Master of Arts in Teaching

Hamline University

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For my amazing husband, Rene. Thank you for filling in all the blanks when I needed you. Your endless encouragement made me believe it could be done.

For my children, Matthew and Gabby. Your love and patience and you guys being you made this journey worthwhile.

For my ISLA family. Thank you for becoming that extension and support that helped me pull it all together.

-You said I could, so I did.

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CHAPTER ONE

Introduction

I remember being a small child of around five or six and my mother coming home with an old-fashioned telephone. The telephone was an old wooden model that did not work. I remember how it fascinated me. It was so different than what we used, but I knew it had the same purpose. My mother allowed me to hold it, to study it, to explore it. It was constructed so simply that I knew I could build my own. In my mind, I saw the design of a replica I could make that would be like the telephone I was holding - only better. I knew I could build a fantastic model. Running to my backyard, I knew I had to find the right materials that could make the design etched in my mind come alive. With a hardwood block, some string, nails, and a big rock for a hammer, I was determined to make my phone. My father saw what I was trying to do, and he helped me to nail the rope to the wooden block when the task was too big for me. Even though he knew it would not work, he said nothing. He helped me build it according to my design, but he only helped when I asked. When it did not work, he encouraged me to look around to see if there were other materials I could use. After several tries and many failures, I invented the best telephone possible using rope and a pair of tin cans. It was my greatest invention. Reflecting on my experience, I appreciated my father letting me figure it out on my own. The process of discovering and creating was a great experience for me.

As a teacher, I love the idea of helping my students to discover what they love and supporting them as they work toward achieving it. With the challenges that teaching offers, I ask, *how does Exploration Time in the classroom affect students' thinking skills?* I still remember

how I the fascination I felt when I was given the opportunity to create that telephone. I loved the feeling of exploration and the great sense of accomplishment that came with knowing that it was my idea, my design and my final product.

My background has made me passionate about identifying students' passions and working toward discovery. My hope in pursuing an answer to my question is to be able to transfer my own passion that I felt building my first telephone to my students so they too can experience an intense interest in making their own ideas come to life. That experience helped me grow as a person. In my own life, I know that if I had not pursued my passion and identified my strengths, I would not be teaching - a profession which I love.

Life Before Teaching

Immediately after graduating from high school I enrolled in college. It took me a bit longer than it takes for some college students, but five years later I became a proud graduate with a Bachelor of Science degree in Technical Communications and a minor in Computer Science. For many people, obtaining a degree is not a difficult feat; for my family and culture, having a degree is a big deal. In Southern Texas, where I was raised, education was not a huge highlight in our lives. College was seen as something you do after you finish high school, but to actually graduate was something that was not pushed or even expected. In fact, after my first year of college, I dropped out for a semester and began working overnight in a dog food factory. It was then that I realized how important it was to go to college and get a degree. I knew that working in a place where I was not challenging my mind would not make me happy. I wanted a job in which I could feel passionate about what I was doing. I wanted a vocation that made me work in the area that I love; not a job merely because I needed to survive.

After my first year in college, I got married and moved from South Texas to Minnesota. Continuing with my education was a challenge, but I moved forward knowing that if I did not finish, I would be spending most of my days in a job doing things I did not love. Eventually, I graduated and was able to work as a software developer and trainer. I was able to program, write, and create. It was wonderful.

After a few years, my husband and I decided to move back home to Texas. My son was four at the time and we wanted to be close to our extended family as our own small family was growing. When we moved to Texas, information technology jobs were scarce. A friend suggested a teaching job. Curious about what educational system my son would soon be joining, I applied at my local public school. I was hired as a teacher with the contingency of obtaining a teaching certificate during my first year of teaching. I figured if I did not like teaching, I could always become a research developer at our local college.

My first year as a teacher proved to be a life-changing experience.

My First Year

I began my first year of teaching with absolutely no experience. Previously, as a software instructor, I was accustomed to the prestige that my position brought. My manuals and training programs were expensive, and companies paid a high price to fly me to various locations to train their employees. Meanwhile, I quickly saw that my first students could not care less about who I was or what I had to say. When I spoke, they were not hanging on my every word and they did not worry about understanding what I was saying.

My first year was rough. My first assignment was a fourth grade class of twenty-four students. Most of my teaching knowledge came from my night classes at my Alternative

Certification Program. My professors were wonderful, but it was difficult to navigate the reality of my first year.

One of my biggest challenges was the concept of testing. Since my school was labeled "at risk," my principal was strongly focused on test scores. My job was to prepare students to pass their Texas Assessment of Academic Skills (TAAS). I was told to concentrate on teaching math and reading standards because that is what students would be tested on. Science and social studies could be taught with reading passages to focus more on their reading scores. It was difficult for me to engage my students with reading passages and test-taking activities. My students rebelled against it. They did the work with little effort or not at all. The class was disruptive and discipline became a problem. I was also desperately terrified that my students were not going to pass the test.

Voicing my fear, I told my principal how I felt and that I could not guarantee that my students would pass the test. She responded that she appreciated my honesty and would reflect on what needed to happen. A couple of weeks later, the fourth grade team was restructured and students were shuffled around. With the shift in classes, my new class now consisted of students that shared one similarity. There were, for various reasons, exempted from state testing. A large majority of students were identified as special education students and were not required to take the test. I had students who were recent immigrants and were also exempted from testing because they had not yet mastered the English language. My other students were those whose scores were so academically low there was little chance for them to pass the test.

Not Teaching To The Test

I had mixed feelings about the change that occurred. Mostly, I felt like a failure. My frustration in having students not be able to read grade level material was compounded by my

feeling of inadequacy and uncertainty about what to do. The spectrum of my students' needs was so vast, I did not know how to find a connection to teach them according to their abilities and what they needed to know. To be completely honest, I also felt that with the switch I was given students that didn't matter to the administration as much as the students who had hopes of passing the TAAS. At that point I knew that once the year was over I would probably seek employment elsewhere; in an area other than teaching.

The principal had a conversation with me after the change to let me know that she had faith I could teach my new class. She told me the students were not taking the tests so I didn't have to worry about making them pass. She listed the positive changes that had occurred: a smaller class size of sixteen students instead of twenty-four, I did not have to worry about tutoring my students during my prep to teach them testing strategies, and I could teach without having the stress of being responsible for my students passing the TAAS.

I understood the reasoning for my principal's decision in changing our fourth-grade structure. I also understood that the students were unaware that they were moved into my class due to their inability to pass a test. I also had a wonderful teacher in my circle of friends who made me see that these students were my responsibility and I had to teach them to be their best. The students still needed to be taught. One day, as I was crying and sharing with her know my frustration, she simply told me, "What can they do? What are their interests? Their passions? Teach them to be better in that." I took that to heart.

As the year progressed, I began to see my students in a different light. As I moved away from teaching with worksheets and test-taking strategies, I saw my students' behavior change. I was still a new teacher and had much to learn, but I was able to teach with more freedom and I was able to choose content and concepts according to my students' interests. Without the worry

of state testing, I was able to teach using different strategies that appealed to my students. As we read *The True Story of the Three Little Pigs* written by Jon Scieszka, my recent immigrants read the book in their native language and partnered with native English speakers to try to read it in English as well. Other students collaborated to understand the book. Each student was responsible for selecting keywords and ideas they were felt were important and they taught the words to the rest of the group. At the end of the book study, students created their own play to present to the lower grades. It was amazing that the students had no trouble memorizing their lines and creating their own costumes. I had a student that was talented at sewing. He taught two other students how to sew and, as a group, they sewed costumes that included the pigs, the wolf, and the narrator. Another student loved to draw. He decided our play needed a backdrop, so he enlisted another student to help. Together they created the pigs' homes and figured out how to make the structures work for the play. Through the process, students chose what was important for them and what they wanted to showcase. It was inspiring to see students that were previously shy and inattentive become students that took homework because they wanted to see results. I would love to say I planned every step carefully, but as a new teacher, I was figuring out the process of teaching as much as the students were figuring out how to get the play done. Throughout my first year, I remembered what my friend had said about understanding the students' interests and passions. Allowing the students the freedom to choose what they wanted to do to present their ideas was easier for me manage. Students, when given the choice of working with what they enjoy, seemed more invested in their learning than when I gave them worksheets and expected them to figure out the right answer.

Growing as a Teacher

After my first year, I felt I had grown as a teacher. My level of comfort in teaching grew as I learned behavior management strategies as well as ways to focus on the curriculum. After struggling in the beginning, my first year ended on a positive note. Even though the majority of my students were still not at grade level, they showed academic growth. There was also an excitement that students were now displaying in their learning. When the lessons were more connected to their interests and allowed the students to be able to express their learning in ways that felt comfortable and capable, they seemed to thrive. The greatest success came when students were allowed to express themselves based on their strengths and not their weaknesses.

As the years progressed, I worked in a couple of districts and a few different schools within those districts. I had the opportunity to learn a lot and see many styles of teaching. Some schools departmentalize while others held on to the self-contained philosophy. For the most part, in large districts, the curriculum was set. Another point that seemed to be similar in most of the schools where I have worked was how the struggling and advanced students were taught. Students that struggled were placed in an intervention program and offered extra tutoring. Students who were advanced were pulled out under a gifted and talented program and taught extra content that was intended to challenge them to their level.

Through my early years of teaching, I noticed that struggling students get more attention through intervention programs. Most of the staff development focused on required strategies we needed to implement for our struggling or at-level students. The advanced students were not a great priority. My advanced students, for the most part, were well-behaved and got their work done. As a teacher, I felt guilty because I did not give as much attention to my highly proficient

students as I did to my struggling learners. I was not trained to know how to handle my advanced students. I saw they had a need, but I was not sure how to meet their needs.

Because I wanted to help my advanced students, I researched resources to help them. That was when I discovered Destination Imagination (DI), an organization that focuses on presenting challenges to students that promote critical thinking in various platforms. It was an after-school program in which students had to work as a group to solve a challenge (Destination Imagination, 2018). I could not facilitate Destination Imagination in class because my time was limited, however I invited a few of the advanced students to join my after -school team. It turned out to be a great experience. Students were excited, and I immediately saw the same student in class become someone different after school. One of the rules Destination Imagination has is that a coach cannot interfere with the team's work. I could not suggest or provide ideas. The work and thoughts had to come from the students. The experience made me think back to when my own father would let me try and fail. When I built the phone, I knew he was letting me own my success.

Bringing Creativity into the Classroom

After ten years working as a teacher in Texas, I moved to Minnesota. The process of becoming a teacher in Minnesota is lengthy and brought me to teach in a different environment than a public-school setting. My first job in Minnesota was as a Spanish specialist in a charter school that did not have an enrichment program for students. The teachers seemed to be doing a great job with their students, but the main focus was closing the achievement gap and making sure that students showed academic success by demonstrating grade-level proficiency. There were no after-school programs or enrichment programs. After a couple of years, I moved on to a private school that focused on helping a small population of students that had been identified as

gifted. Here, the curriculum was written every year to be very specific to the students' needs. The philosophy was to teach to the top. This meant that the most advanced student would set the pace of the curriculum. The logic was that the rest would be able to catch up. The students that were not able to keep up would be moved out to another level more appropriate to their needs. With thirty-eight students in our student body, the concept worked great. Students were able to work at their speed and progress with their strengths. The private school was an amazing experience and taught me a lot about working with students identified as gifted. An interesting observation was that there were instances that their gift was not their passion. One student, identified gifted in mathematics, could work with the most complicated formulas, but would do so with no great enthusiasm. However, when the same student had his hands on LEGOS, he would become extremely excited because he wanted to build something. It made me wonder what would happen if his passion and interests of building were nurtured as part of his education.

Currently, I work at an International Baccalaureate (IB) Spanish Immersion charter school. For the past four years, I have been working as a fifth-grade teacher. Each year proves to be a challenge and each group consists of a diverse group of students at all academic levels. Our curriculum is rigorous, and time is precious to ensure all state standards and essential elements of our IB Inquiry Process are being represented. As I stumble through, I decided a couple of years ago to create an after-school club for students to build a Rube Goldberg, a contraption elaborately designed to solve a simple task (Mad Science, 2015). The Rube Goldberg was meant to be entered in a competition. The rules were not very descriptive, so I chose to mirror the Destination Imagination philosophy in which I guided students without interfering in their process. The students became an after-school team that was allowed to discover and create their own contraption. The machine took three months to build. Through the process, the team learned

how to work together, work hard, and to be dedicated. After spending much time after school and a few Saturdays to get the contraception complete, the deadline finally came and the team recorded their contraption to submit. Sadly, after trying for many hours, the contraption did not work. Failure of the contraption was obvious. The amazing thing, however, was their reaction to the end of the recording. Even though the Rube did not work, the students were so proud of it that they still wanted to submit it. They wanted to show off their contraption knowing well they were probably not going to win. One student said he did not care about winning, but rather he cared about how hard he worked and wanted others to see what they created. The team agreed. As a teacher, I was extremely proud of my students. My students explored and created their own contraption based on their interests and passions. They were proud of what they had created.

The following year, I continued with a new group of students and created a new team. Learning from the past year, the group was better prepared but just as eager to discover and create. That year, the team managed to place second place in the world-wide competition. I will admit I was extremely happy for them, but their enthusiasm about creating their own product was just as strong as the previous team's.

Conclusion

As I am still in the same position at my school, I feel very fortunate to be working in a place that allows me to explore my own passion - working with students to discover their interests and passions. Working with students after school was a great experience. However, I would love to see that passion be sparked for all my students. Understanding that all students have a strength (Gardner, 2011), it would be wonderful to allow time for students to find their passion. When students are engaged and work with their passion, it allows them to initiate their learning (Kurti, Kurti, & Fleming, 2014). My passion would be for all students to be able to

explore and discover their own interests, leading me to ask *How does Exploration Time in the classroom affect students' thinking skills?* This capstone will focus on creating a specific time called Exploration Time designed for students to explore their interests.

The second chapter will present research that indicates that students need time to explore and create in the classroom. The research will focus on Genius Hour, an inquiry-based structure that allows students to structure their time (Krebs, Denise & Gallit Zvi., 2016) as well as Makerspace as a learning environment geared for students to explore and create (Martinez, S. L., & Stager, G., 2013). The research will also focus on various thinking processes to guide the students in exploring their own interests and creating their own products. The third chapter will outline the plan I have in creating a guidebook. The guidebook will outline specific points that will help classroom teachers implement Exploration Time and facilitate the exploration of students' interests. Chapter four will reflect on my progress and find solutions that help students explore their own interests during Exploration Time.

CHAPTER TWO

Literature Review

Overview

The educational system was created to help students learn and become successful members of society. Within the educational system, different approaches and models have been created to educate young minds and prepare them for their adult life. In Chapter One, I discussed my educational experience and my connections to student-centered learning and allowing students to explore their own interests in the process of learning. This literature review explores academic research with central focus of the research question, *how does Exploration Time in the classroom affect students' thinking skills?*

The first topic for this literature review will focus on thinking skills. To fully understand how we can help our students learn, I must understand *how* students think. The subtopics includes the critical, creative, and the design thinking skills. The last for understanding how students think is understanding their intelligences using Gardner's (2011) theory of Multiple Intelligence. The second topic focuses on the creating a structure of learning through Genius Hour. In this topic, I include a portion that underlines the important first step of inquiry. The subtopic for Genius Hour include the principles and process of how Genius Hour functions and can be applied. The last topic is Makerspace. Through exploration time and with the Genius Hour structure, Makerspace allows engagement to happen during the exploration time. The subtopics for Makerspace include defining the Maker Movement which defines how Makerspace originated, the constructionism approach that embodies the maker movement, and how Makerspace is applied in the school system.

Thinking and Intelligence

This topic will focus on identifying key aspects of student thinking. The first section centralizes on how critical thinking and how students can transfer information. The second section reviews creative thinking and the third reviews design thinking. Each thinking skill is identified in this literature review with the intention to define how students are thinking, and how teachers can observe the thinking and process. During a public education even about makerspace, the speaker held about their school's mission for technology. The director of technology discussed how technology could address the soft skills and how to measure success (Padrnos, 2017). This provided me some insight to connect critical and creative thinking with my research. Design thinking was also included as it embodies the process of innovation that occurs when creating projects. Although exploration time will allow students to pursue their own interests, understanding how they think will help in measuring progress. The last section included focused on the multiple intelligence. By understanding the different intelligence that exists, exploration time can also be created to nurture and create an environment conducive to explore within the intelligences.

Critical Thinking

Critical thinking is a process that can be used in a variety of learning spaces that include exploration time. As defined by Ennis (1996), critical thinking is, "reasonable reflective thinking that is focused on deciding what to believe or do" (p. 396). Critical thinking can be applied, emphasized, and has the ability to be transferred into the classroom and outside the educational realm. Ennis surmised the six basic elements in critical thinking known as the FRISCO Approach. The FRISCO Approach represents the acronym that identifies the key elements for critical thinking: Focus, Reasons, Inference, Situation, Clarity, and Overview (Ennis, 1996). As

critical thinking helps in making reasonable decisions in our everyday lives, it is important to practice and nurture critical thinking as part of our education. As education helps us strengthen our critical thinking, it is also important to transfer that knowledge and apply the process in other venues.

In a study done by Hudgins and Edelman (1988), the focus was to capture how a group of fourth and fifth graders could conceptualize, define and measure critical thinking. To measure their findings, researchers focused on developing and identifying specific criteria to determine what could be assessed as a form of illustrating critical thinking skills. The thinking tasks that were introduced to students were task definer, strategists, monitor, and challenger. As the students worked in groups they defined their tasks. The task definer presented the idea and made sure everyone in the group understood the problem and agreed on what needed to be done. The strategist facilitated the method of solving the problem. The strategist also facilitated how to organize the information. The monitor reviewed the problem to make sure the group is on the right track. The challenger had the job of questioning the reasoning behind ideas and answers. The challenger also invited group members that did not participate to participate. Through their findings, it was concluded that students that were taught these tasks and apply them to problems, were able to display self-directed critical thinking attributes that included acquisition, internalization and transfer of ideas (Hudgins & Edelman, 1991).

In another study by Riesenmy, Ebel, Mitchell and Hudgins (1991), in which the study group also focused on fourth and fifth graders, it was taken a step further to determine if the transfer of self-directed critical thinking skills occurred in a way that proved the skills were retained and transferred. In the study, two types of transfer of knowledge were identified: vertical transfer, which occurs when a new task is similar in content but demands previous learned ideas,

and lateral transfer which requires a transformation of knowledge to a new kind of task. The study found that self-directed critical thinking skills were visible after an eight week period of time. Understanding that knowledge can be transferred ways can build on how students can transfer their own knowledge in a self-directed way. Allowing them exploration time provides them the freedom to be self-directed in their own critical thinking skills.

With the studies, groups worked together to step through the critical thinking process. The importance of identifying the critical thinking process is understanding how the students are thinking and can apply their thinking skills during their Exploration Time. It is also important how students can process information and apply it to new scenarios. Creating an environment such as Exploration time can allow the students flexibility to use different methods for critical thinking. By allowing students to use critical thinking skills in tackling different problems, students can apply their critical thinking skills and transfer their process into the classroom as well.

Creative Thinking

Drapeau (2014) asks, "What would happen if all teachers encourage students to think creatively and produce creative products?" (p. 2). The question begs to explore how our educational system approaches creativity in our classroom and curriculum. Creative thinking is an idea in which has no clear definition. Based on different views and cultures, creativity may be seen and valued differently. For the sake of this literature review, creative thinking will be defined as explained by Torrance, creator of the Torrance Tests of Creativity Thinking:

> Creativity thinking as the process of sensing difficulties, problems, gaps in information, missing elements, something askew: making guesses and formulating hypotheses about these deficiencies, evaluation and testing these guesses and hypotheses; possibly revising

> and retesting them; and finally communicating the results (as cited in Shaughnessy, 1998, p. 442).

To be creative, students need to analyze the problem with all the information presented, ask what's missing, re-evaluate if necessary, and formulate answers or results. According to Drapeau (2014), creative thinking is also a preference in which some students may choose to think critically or creatively (p. 5). Although both might be used, the intention of this review is to define creative thinking in steps that can be visible and measurable.

Another way that creative thinking may be seen is through stages. According to Tomlinson, creativity can be measured in four stages: preparation, incubation, illumination, and verification (Tomlinson, 2017). Based on Tomlinson's four stages, there is alignment to how Tomlinson categorizes and Torrence's definition of creativity:

- Preparation is the first stage where the information is presented to be researched. Connecting to Torrence's view of creativity, this is where the students analyzes the problem with all the information presented.
- Incubation is the second stage that allows the student to pause and back away from the information when the solution does not immediately present itself. Torrence would view this as the re-evaluating process.
- Illumination is the third stage in which the students gains insight with a possible solution. Torrence would align this to formulating the answers.
- Verification is the last stage that tests the product and shared with an audience. In Torrance's definition, verification is when the information is communicating the results to others (Shaughnessy, 1998).

By establishing the different stages and aligning them with Torrence's description, creative thinking can be measured and seen as students explore their interests and projects during Exploration Time.

Design Thinking

Design thinking is fully understanding a problem before moving forward in finding a solution (Bell, 2008.) Design thinking originated in the business world but is slowly visible in the education world where this type of thinking benefits students allowing for a more meaningful learning process (Smith & Madar, 2017).

In design thinking, there are five specific steps in approaching a new project. The following describes each step (Coleman 2016):

1) Understand/Empathy - Understanding focuses on knowing as much as possible about the audience and their perspective of the problem.
2) Defining the issue - Understanding all facets of the issue and how it matters to the audience.
3) Ideation - Brainstorming and allowing as many solutions as possible.
4) Prototype - The creating and representation of the idea to show to the audience.
5) Testing and sharing - Testing the product and sharing the prototype to the audience (Coleman, 2016).

In Coleman's article, from the five steps of the design thinking process, the first one, in which empathy plays a key component is the cornerstone of the creation of a new product. The thinking process takes an approach that is more centered on the audience's needs in developing an product. Without understanding the person the produce or idea affects, the design process fails to meet of the audience (Coleman, 2016).

Considering all the steps of the design thinking process and how to implement in the classroom, evaluation is important to measure success or failure. In a practical approach, Adams and Nash developed a guide to evaluate the thinking process in which evolution can happen in 3 parts: understanding the need, ideation, and testing (Adams & Nash, 2016). A large portion of understanding the need is understanding empathy. To evaluate empathy, Adams and Nash suggest to focus on four components of empathy that include discovery, immersion, connection, and detachment. Each step can be evaluated as part of the design thinking process to establish connection to the audience and empathy level (Adams & Nash, 2016). The second part of the evaluation is ideation in which one can evaluate by identifying the desired experiences of the stakeholders.The last part of in assessing is the actual evaluation of the prototype and adapt until the desired experience is achieved (Adams & Nash, 2016). By understanding the different phases of the design process and what constitutes as a design project, when students are at the stage where they have a specific problem based on empathy and want to create a product, the design process can be used during exploration time.

Multiple Intelligence

The idea of students working independently to explore their level of interests allows them to be engaged in the areas of their intelligence. In 1983, Howard Gardner introduced a new theory which defines intelligence as several different skills rather than unitary measure that is defined by a specific intelligence quotient (IQ) (Campbell & Dickinson, 1999). In his book, *Frames of Mind: The Theory of Multiple Intelligence,* Gardner identified intelligence as the ability to solve a genuine problem to create a product (Gardner, 2011). When Gardner explored the theory of multiple intelligence, one goal was to examine the educational implications. It was his belief that if an individual intelligence could be identified at an early age, it would benefit the

person in the educational realm. By the student creating a sense of his abilities, it could develop into an interest for the student's strong points and be nurtured in enrichment programs. (Gardner, p. 10). Keeping in line with Gardner's theory, allowing students to exploration time in the classroom to find and nurture the student's intelligence.

Creating exploration time to target the thinking process works well with the concept of allowing students to work with their strengths. With multiple intelligence, students work with their strengths and build in thinking skills to create a product. Exploration time should be student driven, but intelligent environments can be set up for students to explore and work with their intelligence. The following are considerations that can be included for the different types of intelligence which students can work with during their exploration time (Campbell & Dickinson, 1999):

- Linguistic intelligence - focuses on language and verbal skills. During exploration time, allowing listening, speaking, reading, and writing is part of the linguistic growth.
- Logical/ Mathematical intelligence - includes logical thinking, problem-solving, reasoning and identifying patterns and relationships. Mathematical and logical problems such as coding, constructing, math-related problem solving and most STEM activities would target the intelligence.
- Spatial intelligence - is defined as visual imagery which a person can perceive three dimensional object. Establishing visual tools that nurture the visual arts could benefit students during exploration time.

- Bodily-kinesthetic intelligence - is expression through body and mind. During exploration time, allowing drama, dance or variety of different physical education can center on body-kinesthetic intelligence.
- Musical intelligence - is understanding rhythm and composition. Including music and sound can be included during exploration time.
- Interpersonal intelligence - is the ability to understand and communicate with others. Exploration time can include collaboration and group work to nurture interpersonal intelligence.
- Intrapersonal intelligence - is understanding self that includes self-esteem, goal-setting and how one sees themselves. Exploration time can include a nurturing environment that allows students to have peer support and reflect on their emotions and goals (Campbell & Dickinson, 1999).

In a study in which six different schools, two elementary, two middle school, and two high schools implemented multiple intelligence curriculum for five or more years, results were explained in which resulted in positive academic effects regardless of student background. Teachers were allowed to create an environment in which the focus on the multiple intelligence rather than standardized testing (Campbell & Campbell, 1999). In understanding the multiple intelligence, teachers can be aware of student's strengths and at the same time create an environment for all the intelligences to be explored.

Conclusion

As I researched the various thinking process, a commonality was finding a problem creating a solution. Stepping through the solution, however, may look different based on student's interest and knowledge. To take it a step further, it is also important to create an

environment in which all the intelligences can be nurtured would benefit the student by allowing them to strengthen the different intelligence that make them successful learners. Creating a specific time for students to explore and step through the thinking process can be accomplished during Exploration Time. To create a time such as Exploration Time, Genius Hour will be used as a structure in which a student can explore their interests and step through the thinking process.

Genius Hour

The concept of Genius Hour is a simple one. Students are allowed to pick a subject of interest and learn more about it. Some companies have been allowing their employees to pursue their own interest but Google made it notable. Google implemented a 20% time policy which allows their employee to spend time in their own interest that is not part of their duties as long as it is to help the company. Within the time frame, employees have created new products that have made Google an important company with new technology such as Google Earth and Gmail (Padilla & Mieliwocki, 2015). This section will focus on the inquiry of Genius Hour, key principles for Genius Hour, and the six phases of Genius Hour that guide the process. Genius Hour provides structure for students that have a project to work on based on their interest. It provides an application of standards to gain understanding on a topic that interests them (McNair, 2015).

Inquiry with Genius Hour

Genius Hour allows students to work on projects of their own interests. The first step that is important to allow students to explore is the inquiry process. Inquiry is allowing students to come up with their own questions in which they explore to find answers in a topic that matters to them. To provide a solid foundation with inquiry, it is also important to understand what invites curiosity. Inquiry happens when students want to know more. Something that has novelty,

complexity, mystery and fascination makes a good entry point to begin the inquiry process of creating questions and investigating (Barell, 2008).

Different knowledge. Inquiry is a never ending cycle and is the building of different types of knowledge. The different knowledges include: personal and social knowledge, knowledge systems, and communication systems (Short, 1997).

- Personal and social knowledge makes connection with the student's life.
- Knowledge system includes subjects that students can use to organize their views.
- Communication system provides students ways of creating and communicating meaning by using various forms of expression such as language, art, and movement (Short, 1997).

With each knowledge, the students build connections with their interests and can start formulating ideas that can start the inquiry process.

Starting the inquiry process. One of the ways to start students asking questions is by providing an environment that invites curiosity based on student's knowledge. One method that draws from the personal knowledge is having an inquiry journal that allows students to reflect on their own experiences. Students can write based on what they know or they can write based on what they think about themselves (Barell, 2008).

Observation is another form of creating the inquiry process. As mentioned with Short's identification of knowledge system a student must organize their thoughts into subjects they are familiar (Short, 1997). In today's classroom, curriculum is structured in different content areas such as math and language arts; however, known for system based learning goes further to the knowledge system to be viewed as subjects that can be categorized based on a model of reality which is comprised of time, setting, key people, social patterns and assumptions (Brady, 2004).

Students can observe and dive into the inquiry process by categorizing in a manner that has more connection to their own personal experience. Through observation, communication system is also possible when students have the opportunity of examining a piece of art, or a diagram they might have seen through research which allows them to present their ideas to others (Short, 2017).

Key Principles for Genius Hour

Genius Hour is based on some guiding principles that focuses on student learning in a self-directed approach (Heick, 2014).

80/20 rule. Although Genius Hour is known for the allowing 20 percent of dedication time, the 80/20 serves as a structure to let students know there is a sense of dedicated time to work on their projects. The time allotted for Genius Hour is dependent of the classroom structure (Juliani, 2013). Most importantly, by providing specific time, it honors a usable pattern for student learning in the classroom (Heick, 2014).

Sense of purpose. Genius Hour provides intrinsic motivation where students can develop a sense of purpose in what they are working. Students explore their own curiosity and connect their projects to a true purpose rather than providing just another project that is required by the teacher (Heick, 2014). In a Ted Talk, Daniel Pink presented a powerful argument for intrinsic motivation. He spoke of a study of when a group of people were provided by extrinsic rewards in skills that required cognitive skills, the group tended to perform poor. His illustration proved the importance of having intrinsic motivation and creating autonomy do produce better results in creating products that need cognitive skills (Pink, 2009).

Design. During Genius Hour, students are allowed to create their own learning experiences (Heick, 2014). In this principle, when students create their own design, they are being encouraged to be creative and take risks (Spencer, 2017).

Inquiry. Inquiry is having a question that will lead the project and research. By having a question that requires more than a yes or no answer, the students make their investigation more meaningful (Krebs & Gallit, 2016). With inquiry students navigate and dive into gathering information and knowing more about their topic (Heick, 2014)

Creating. Creating is one of the core principles where students make, design or create their project. (Heick, 2014). Although it is a good idea to set ground rules, the time usd should provide autonomous learning where students can dive into their project and work at their own pace. (Krebs & Gallit, 2016).

Socialization. Another key principle is the socialization that takes place during Genius Hour. Students have an opportunity to connect with teachers, experts, and other students in order to establish connections about their projects (Heick, 2014).

Six Phases of Genius Hour

Genius Hour provides a process that helps students in creating their project while still maintaining ownership of the project. In the book, Genius Hour, the author describes six phases of Genius Hour (McNair, 2017). The six phases are described as passion, plan, pitch, project, product, presentation.

Passion. Passion is having a strong feeling about an idea. In order to understand a student's passion, a teacher must observe and communicate with the student to find their interests (McNair, 2017, p. 27). Creating a safe environment also allows students to know they are supported and encouraged to be creative. Once the environment has been set, teachers can

also encourage ideas by having students brainstorm what they would like to learn (Krebs & Gallit, 2016). As teachers learn more about the students, teachers can guide them into identifying their passions. If a student does not recognize their passion, the teacher can also provide different strategies such as graphic organizers to organize thoughts and process their feelings to identify their passion. (McNair, 2017).

Plan. The planning process is where the student organizes their idea and creates specific steps to work on the project. When planning, it is important to keep in mind the audience, what is supposed to be accomplished and who can help reach the goal (McNair, 2017, p. 37). In planning, it is also important to create inquiry questions. The questions are meant to be open-ended where they use as a guide to pursue more information. (Krebs & Gallit, 2016).

Pitch. Pitch occurs when students present their ideas to the class for input. During the pitch process students collaborate on the idea and provide input. It is also an opportunity for others to hear their ideas and make their ideas known (McNair, 2017, p. 48).

Project. The project phase is when the student starts the work process. During this phase, materials are identified and collected. Research is also developed according to the project and student's knowledge. If more information needs to be gathered, students can use several resources such as interview with content experts. Depending on the student, the research may look different according to the project's need. Genius Hour does encourage research, however, not at such rigid level as to discourage the student to continue where the end result is creating rather than inquiry. The student is required to research, but depending on the topic, research may look different according to what the student is trying to accomplish as a final product (Krebs & Gallit, 2016) to hold students accountable, students also need to record their process. When they

write what they have accomplished, students can also connect their project and actions to standards or what concepts they might have used (McNair, 2017, p. 68).

Product. Allowing students to work at their own pace is also important as each project may need different deadlines to complete. When the product is complete, the product must be shared. Sharing the product to others in an important part in order to validate the work that has been done. The audience must be authentic and have some connection to the product (McNair, 2017, p. 81).

Presentation. When students present, presentation allows them to explain their work and process. Based on the student, the presentation may be different. When the process is completed for the project, it is important for students to continue to have questions to demonstrate the learning process and continue learning (McNair, 2017, p. 94).

Although the process is helpful in creating a layout for Genius Hour, the author focus is leaning towards the specific population of Gifted and Talented students that have a clear idea of their interest (Winterhalter, 2017). If students do not have a clear definition and need more guidance, questioning techniques might be helpful in allowing the students to explore their interests as well.

Genius Hour Conclusion

Genius Hour allows students to pick their own projects based on their interests. The key principles of Genius Hour are allowing specific time throughout the week for a student to work on their process and creating the sense of purpose. The six phases of Genius Hour guide students with their projects while allowing them to create their own learning experience.

If the student has already identified their interest and project, Genius Hour is a solid structure to follow. However, if the student still needs time to explore, the student needs a space to explore their passion. Makerspace is such a space.

Makerspace

Makerspace can be described as a DIY (Do It Yourself) space created for making and creating. It comes as a gathering place but is defined by what it enables: making (Roslund, 2014). School communities use different models to implement Makerspace. This section will provide an overview of the Maker Movement, defining who the makers are, and its impact in education. This section will also review the constructivist approach that embodies the Makerspace philosophy and, finally, the STEM connection and product results that are created in Makerspace.

Maker Movement

Although making things is not a new concept, the maker movement focuses on creating an environment in which one can tinker and play as a process of making. With the increase of technology readily available, a person has new ways to create, repair, and design things in which in the past was not as easy to manipulate. The Maker Movement originated with people coming together in spaces where they could share and explore their interests. The various spaces may have different interests, but they all have the passion of tinkering and creating in common (Libow Martinez & Stager, 2013).

In 2014, President Barack Obama called our nation to commit in this movement in an attempt to encourage our students to experience more hands on STEM (Science, Technology, Engineering and Mathematics) to help them connect to real world solutions. With the support of the White House, new grants and educational initiatives, the Maker Movement stemmed out into

communities as well as the educational system ("Fact Sheet: New," 2016).

Defining makers. Dale Dougherty, creator of Make magazine, defined Makers as "enthusiasts who played with technology to learn about it" (Dougherty, 2013, p. 1.). According to Dougherty, Makers are enthusiasts that love doing what they do. Makers love control, love to do what they do, and love to figure things out (Dougherty, 2011). With the idea that makers love to create and learn, creating an environment that is conducive to making can the Maker can realize their passion and talent.

Makers and technology. Technology plays an integral part in the maker movement by connecting the digital world into projects (Smith & Smith, 2016). Although Makerspace can be a place to build with no digital technology, the idea of Makerspace has a strong connection to technology. Smith and Smith (2016) validated this statement by illustrating how a fourth grade makerspace houses technological tools such as electronics, circuit boards, and robotic kits to challenge students in creating projects. In other spaces, the use of tools included prototyping tools such as 3D printers and laser cutters (McKay, Banks, & Wallace, 2016). Tinkering and making can occur without technologies but what technology provides is the bridge and connection to creating things in a more advanced way that prepares us for the future.

Constructionism Approach

Constructivism, an approach to learning, depicts learning as student-centered. In order for the learner to gain knowledge, the learner must construct to gain understanding. Learning does not happen by listening to others; learning occurs when the learner experiences and interprets what is happening (Sadker & Zittleman, 2010). In Makerspace, Papert took the idea of constructivism a step further to include action as part of the constructivist theory (as cited in Martinez, 2013). Constructionism takes constructivism and applies student-centered learning in

the Makerspace environment. In the constructionism approach, the learner is engaged in creating, but also in making a meaningful connection to what they are creating and sharing their thoughts or products with others. As they are creating, the learner is also going through the inquiry process asking what else can be done with what they create. The need to share their creation and/or process is part of the process.

Constructionism in Makerspace is very visible in how the students are engaged in learning and willingness to share with others. In Makerspace, three general categories define the space and how students interact with others as well as construct: making, tinkering, and engineering (Martinez, 2013).

According to Martinez, making is "about the active role construction plays in learning. The maker has a product in mind when working with tools and materials" (Martinez, 2013). To define it a bit further, Seymour Papert defined making not only in tools and materials, but in ideas (as cited in Litts, 2015). Making is when learning is happening when one is constructing both ideas and artifacts simultaneously. Constructionism is the process of making a physical product, but at the same time thinking of what is happening and making more ideas to continue the process (Litt, 2015).

Tinkering is more of a mindset and a way to approach a problem through experiencing and discovery (Martinez, 2015). Tinkering allows the learner to explore without knowing the end result. As the learner gains more understanding of what they are constructing and exploring, the learner improvises a solution. With tinkering, the learner is also asking along the way without knowing the end result (Bevvan, Petrich & Wilkinson, 2015). The benefits to tinkering is the release of thought that the end product must look or be a certain way.

Engineering is using basic principles to design and create a solution to a problem (Cook, Bush, & Cox, 2015). In Makerspace, as learners investigate a specific problem, the design process takes place using science, math, art, and engineering (STEAM) to design a plan and create a solution.

Makerspace in the school

With the the maker movement focus on having a space to create and make, a natural location would be in our schools. As stated in her book, Martinez stated that children learn better as they become more engaged in tinkering and making (Martinez 2017).

Today, many schools are implementing Makerspace as part of a learning environment created by the Maker Movement. In an article by Smay and Walker, Makerspace and educational curriculum is reviewed to explain they were able to work together. In Shorecrest Preparatory School (Pre-k through grade 12), Makerspace was implemented to enhance the curriculum. In the primary school, Makerspace had the purpose to enhance the curriculum (Smay & Walker, 2015). The first step in implementing Makerspace was to introduce to the teachers the tools available and how to use them. The next step was to show the students themselves in hopes of creating interest and allow them to expand their mind in thinking of ways the space could be used for solving problems in future projects. The third step in implementing Makerspace was educating administration and faculty in the maker movement and its possibilities (Smay & Walker, 2015).

In developing a Makerspace in education, the central idea is focused on student centered learning. A model of the process of creating a Makerspace in a school can be followed by observing how New Milford High School began their own Makerspace (Kurti, Kurti, & Fleming, 2014). When the school began developing their Makerspace, the initial step was observation. In

this scenario, the newly hired librarian supported by her principal began observing the daily activities of the students. This observation was to develop a space that would be centered around the students interests and needs. As the author stated in the article, “Much of the later success in student engagement can be attributed to the early observations.” (Kurti, Kurti, & Fleming, 2014, p. 21.). Based on student’s needs, materials that allowed students to create using technological tools such as MakeyMakey, LEGOS, Little Bits, and a 3D printer were purchased. Taking the tools, the library designated an area for Makerspace. The initial student engagement was not an immediate success. Although the area was set up, there was little interest by the students. To encourage the students, the librarian provided little tidbits to entice the students. When interest was shown, small adjustments to the space was done to gain student interest (Kurti, Kurti, & Fleming, 2014).

As a result of implementing Makerspace according to student needs, New Milford High School established Makerspace with two types of stations: fixed and flexible stations. Fixed stations can have students work with no assistance. Flexible stations change on a rotation basis. (Kurti, Kurti, & Fleming, 2014).

Makerspace Conclusion

Makerspace as a Do-It-Yourself space with the idea to create. The Maker Movement was creating a community of people with similar interests to share their works and projects. With technology being an intricate part of Makerspace, tinkering became a main focus allowing people to explore without having a defined project. Connecting to education, Makerspace takes the constructivism approach a step further and includes action and creating making the constructionism approach that is defined as constructing to learn (Martinez 2013). Makerspace in school is slowly growing to allow students to explore and find their interests.

Conclusion

The literature review presented in this chapter provides an overview of student's thinking that includes critical, creative and design thinking. It also provides a review of the different multiple intelligence. Understanding the different types of thinking creates a base foundation for my research question, *How does allowing Exploration Time in the classroom affect students' thinking skills?* The research presented in this chapter in regard to the different thinking introduces the different types of thinking that can be observed and measured during a specific time in school called Exploration Time. It also provided the different types thinking to allow students the flexibility to be in different phases of their exploration and still be aware of their thinking. The multiple intelligence was also included to establish a foundation of student's strength in which they can explore within exploration time.

Along with the thinking and intelligence, this chapter also presented an overview of Genius Hour and Makerspace. Genius Hour provides a structure in which students can pursue their interests and passion projects. However, to address the need for students that may not be aware of their own interests, the inquiry process is essential to guide students into their exploration. Genius Hour provides the flexibility for students to set their own learning pace and interests with the accountability of creating a project at their exploration.

Makerspace provides the tools and space for students to work in any step of their exploration. In the beginning stages, students can use Makespace concepts to explore and work with challenges based on their interests and intelligence. If a student has already identified their specific project, Makerspace also allows students the tools and space to problem solve and create their product.

Chapter three will provide more detail in the structure of Exploration Time. It will follow the structure of Genius Hour allowing students to select their projects based on interests and provide a structure of time dedicated for exploration. It will also provide a guideline of space and environment that will nurture exploration according to the different intelligence students can explore and strengthen. The third chapter will focus on creating a guidebook that identifies guidelines in monitoring and setting up visible thinking for the three thinking skills (critical, creative, and design) to help guide Exploration Time.

CHAPTER THREE

Project Overview

Introduction

The purpose for my capstone is to explore the research question, *how does Exploration Time in the classroom affect students' thinking skills?* In this chapter, I will explain the audience, the framework and the project description that will focus on the research question.

Exploration Time is identified as a specific time during a student's academic week in which a student can either work on a project based of their interest or explore with the purpose of identifying their interests. During the student's academic week, it is important to allow them time to explore and work on their own interests. My goal is to create a guidebook to help teachers set up Exploration Time so that students can work independently but in a structured environment that will also make them accountable for their learning. In Chapter Two, the literature reviewed guides the formulation of the guidebook that structures the guidebook for Exploration Time.

Chapter Two focused on research literature that identified the different thinking processes to help guide the students and teachers during the Exploration Time. If a student is struggling in

finding an interest, it is crucial to help guide students to find their interests. The Multiple Intelligence Theory (Campbell & Dickinson, 1999) examined during the literature review was used to help create an environment that allows students to explore work with interests based on their strengths. The guidebook created for this capstone will help teachers implement Exploration Time to follow the Genius Hour Six Phases with flexibility of a Makerspace environment.

School Philosophy and Setting

Philosophy

The school in which Exploration Time will be implemented follows the International Baccalaureate (IB) model. In an IB school, students learn through an inquiry based process that allows the students to think critically and independently making the IB school an ideal environment for students to explore their interests. In the elementary level, the Primary Years Program (PYP) focuses on units of inquiry which center around global concepts preparing students to become caring, lifelong learners (IBO 2017). The IB environment seems ideal as it encourages students to think and create action as part of the learning process.

The school's mission also states its commitment to empower the student by nurturing and developing personal growth and strong character (ISLA, 2017). The school takes an inquiry approach whose philosophy strongly aligns with student centered learning and empowering the student to make choices regarding their academic growth. My aim with Exploration Time is to empower the students to grow in character based on their interests.

Language and Class Size

The school I chose to implement Exploration Time is a Spanish Immersion school where students are not exposed to English until second grade. The district has a specific goal to limit the school size and students per classroom. To keep the size below 350 students for the school, the classroom has a limit size of 25 students. Each grade level also has a limit of two classrooms. Students begin English instruction in second grade with exposure of thirty minutes of English in which fifteen minutes per grade level are incrementally added. By the time students reach fifth grade, English daily instruction is one hour and fifteen minutes. The majority of the students are English dominant speakers who have been in the Spanish Immersion program since kindergarten. The students in which the plan is designed will be instructed in Spanish. To allow for the flexibility to use resources that are mainly in English, students will be allowed to research in both languages, but the end product and presentation must be produced in Spanish.

Technology

The school has a computer lab available with thirty computers. Teachers have access to the computer lab with some restrictions during testing periods. Kindergarten through third grade have seven Chromebooks per class as well as one iPad per classroom. Fourth through sixth grade have a one to one Chromebook ratio.

In addition, the Art room is also available four days a week in which Makerspace has been implemented for the school. Technology available for the school, apart from computers, include a variety of learning tools such as FunkeyFunkeys, Ozobots, and other types of technology that allows students to create using technology. Other materials such as circuits, cardboard, wood, and other non-digital materials are available in the Makerspace room

Audience and Participants

Audience

The audience for the guidebook are the teachers and students in a fifth grade Spanish Immersion setting. Although the guidebook is designed specifically for a fifth grade classroom in a Spanish Immersion setting, the design and structure is in English where it can be adjusted and followed by other teachers in other schools as most of the design will be done in English.

Participants

The school in which the program will be implemented is a public charter school located in the west metro of Minneapolis. The participants will be a 5th grade classroom with twenty-two students (ten boys and twelve girls). Most of the students are middle to upper class with strong parental support. The free and reduced lunch for the school is 8%. The population is also 62.8% white, 1.6% Asian, 2.2% Black/African, and 5% are two or more races (Minnesota Report Card, 2017).

Framework/Theory

Exploration Time is designed with the Constructionism Theory developed by Seymour Papert in which centers on the idea that learning is an active process. Constructionism learning is allowing students to construct and explore to gain understanding (Martinez, 2013). For students to learn, they create and think about the process (Litts, 2013). Although the purpose for Exploration Time is for students to work and create projects of their interest, students must first be allowed time to explore and think about their interests to gain understanding.

The timeframe in which the guidebook was developed for Exploration Time was in the Spring of 2018. It will be completed as a course requirement. The guidebook is structured with the intention that Exploration Time is allowed once a week where students are allowed a specific time to work on their interests. The guidebook was also be guided by the six principles of of

Genius Hour (Heick, 2014) as well as the Design Thinking Process for creating a product. As Phase One - Exploration, in the guidebook is the longest and the phase that sets up the Makespace environment, the guidebook begins by outlining the materials and how they are connected. Once the Makerspace requirements are identified, I focused on describing Phase Two through Four to provide a brief description of each phase, what students need to accomplish as a step by step process as well as what the teacher needs to look out for and how the teacher knows the student can move on to the next step. The guidebook was completed by May, 2018.

Project Description

For this project, the goal was to develop a guidebook that will help teachers to implement a specific time called Exploration Time as a forty five minute time a week where students work on their area of interest or explore to find their interest. The guidebook is divided into four sections: Phase One - Exploration, Phase Two - Research, Phase Three - Design Process and Phase Four - Product Development and Presentation.

Phase One - Exploration

Phase One is intended as an optional phase in which students may begin by exploring in a Makerspace environment based on their interests. If students do not have a clear idea of how to begin, activities connected to the multiple intelligences are provided to assist the teacher through expose the student to different interests. The purpose for Phase One is to allow students to explore their interests in a Makerspace setting based on their strengths without the burden of having a clear direction of the end result (Bevvan, Petrich & Wilkinson, 2015). To create a time for true exploration students will be allowed to tinker and explore their interests and strengths. Once they reflect and determine an interest, students will then be able to move on to the next phase. Because it is a phase of pure exploration, no deadlines will be required of the students to

develop a project; however, during the design process, they will need to establish a timeline for their product. This is intended for students to work at their own pace yet still be accountable for their work and time.

Environment. During Phase One, students will be allowed to explore their interests. A Makerspace environment was developed with the intention of allowing students to nurture and explore their multiple intelligences. Some intelligences will be done in a more organic way which follow the process of the project, but others will be done in a more purposeful way during the Phase One of the Exploration Time. To strengthen and explore the logical/mathematical intelligence, the environment provides technology such as coding and a variety of robotic tools that target mathematical and computational skills. Spatial intelligence will be addressed by using activities aimed for creating the development of prototypes using other materials that enhance three dimensional thinking. The musical intelligence will be targeted with some applications such as music along with a variety of musical instruments and videos will be accessible during their time for exploration.

Other multiple intelligences such as the linguistic, kinesthetic, interpersonal, and intrapersonal intelligences will be nurtured through the student's process of the project in other phases of Exploration time as well. Once the student is comfortable in identifying an area of interest, the student will then move on to Phase Two.

Phase Two - Research

Based on McNair's six phases, Phase Two of Exploration time will follow the plan, pitch and product in which the student will identify what they want to produce (McNair, 2017). The purpose to include McNair's six phases is to guide the student's inquiry and develop the research needed to create a product. In the Research Phase, students will explore what they want to learn,

research and gather as much information and define their level of interest. Depending on the project, the research may include a variety of sources. During the Research Phase, the student must end with a clear question of what they want to accomplish at the end.

Phase Three - Design

During the Design Phase, the student will identify the product they hope to accomplish at the end. Students will also create a plan of action that will following the Design Thinking Model (Coleman, 2016). In creating a plan of action, students will also include a time frame, materials list and a model or prototype that illustrates how they will work to accomplish the product.

Phase Four - Product and Presentation

Product and Presentation is where students will create the final product and consider how to present their final product. The last phase of Exploration Time will include students sharing their project or taking a specific action plan to ensure the product is used or presented for the intended audience.

After completing and presenting the product, students will have the opportunity to reflect on their project and their thinking process.

Assessment

Assessment will occur in each section to ensure students can progress to the next phase. At the end of the phase, the students will fill out the questions for each phase as well as the Final Completion Page for each phase. The questions and Completion Page are intended to capture the students' knowledge and information for each phase. The guidebook will also include a Non-Completion Page in which students will need to include relevant information based on their project and knowledge. The questions for each phase serves as a student checklist as well as an

explanation for teacher to ensure students are on the right track. Each portion of the checklist will be explained in the guide book.

Apart from the student checklist, Visible Thinking Routines are included in the guidebook, Visible Thinking Routines will be available for teachers to use as a form of informal assessment in understanding students thinking during the process.

Summary

Chapter Three outlined the participants, setting, and philosophy of the school and students that are involved in the project. The framework for this capstone based on the theories researched in chapter two were also discussed and aligned with how Exploration Time was designed and how the guidebook is structured to help students through the thinking process. designed. Combining Makerspace, Genius Hour, and the Design Thinking Process, the guidebook was developed to allow students to first find their interests, and once the interest is found, have a structure that both teacher and student will know what needs to be done in order to move forward in the project.

Chapter Four will provide the reflection of the project, a review of how the literature review assisted in the development process of the guidebook and a reflection of how the guidebook was developed. Chapter Four will include the implications of the project and an in depth reflection of my journey of writing this capstone.

CHAPTER FOUR

Conclusion

How does Exploration Time in the classroom affect students thinking skills? My journey in learning more about this question has led me to ask, think, research, and reflect about what it really means to allow students time to explore their own interests. To fully understand how students explore, I first had to learn about how they think. Through research, I focused on three specific types of thinking skills: creative, critical, and design thinking. My hope in focusing on these three types was to connect them to their interests as a venue to create. For the students that do not have a concrete idea of their interest, they must first be allowed to explore. I chose to research Makerspace and find the connections of Makerspace to Multiple Intelligence as the platform for exploration. Wanting to move students along who already had an idea of their interests, I chose to align their process of creation creating process and research to Genius Hour and the Design Thinking Process. Using Genius Hour as an outline allows students a loose structure yet creating enough concrete steps with the Design Thinking Process to navigate them to create their project and produce a final product.

This chapter is a reflection of my journey in creating a guidebook to structure Exploration Time and to explore and define my question. I reflect on what I learned through my process, the use of my literature review, what knowledge I gained and what I found useful. In this chapter I also state the implications of my capstone, potential future projects, and where I go from here.

What I learned

When I began exploring my capstone I knew my interest focused on identifying and working with students' strengths. My struggle was identifying what 'student strength' meant. I realized that I wanted students the opportunity to explore their interests. As a 5th grade teacher, I

quickly learned that merely telling my students to work on their interest with no clear direction of what that meant was not a great idea. The students were as clueless as I was as to what that was supposed to look like. Without structure or guidance students took it as free time to play games. Realizing the importance of creating a structure for students to explore their interests was crucial in my growth as a professional educator. I needed to understand their need for structure as I understood their need to explore their interests. In that need, I wanted to create a guidebook that would align to the student's need and a teacher's expectations.

Content Experts: As I worked with the capstone, another challenge I found was working with my content expert. I had chosen a Makerspace teacher at a local district. She is a wonderful person that took the time out of her busy schedule to guide me with understanding how Makerspace could be implemented in a school setting as well as providing me her opinion of combining Genius Hour and Makerspace. To have an expert that worked on Makerspace in education was extremely valuable. The challenge was setting up a time to converse with her and bounce my questions and thoughts in a timely manner. Understanding that my content expert was mentoring me on a volunteer basis and knowing her busy schedule, access to her knowledge was limited. When I struggled and needed guidance, I also enlisted someone that was easier to communicate, my own school's IB Coordinator. She also provided me with valuable insight to help create an environment that would nurture inquiry in students and guided me to question how I needed my students to think about their projects. Through both people whom I used as content expert, I was able to synthesize their information. I learned how to take the best from experts and apply their knowledge to my own project and my own goals. Transitioning from one person to another also made me aware of the importance of knowing my priorities. Listening to people I respect and still keep my own thoughts was not an easy process for me. As valuable as their

suggestions were, not all of them were aligned to what I wanted to accomplish with my guidebook. I did need to take time to step back and reflect if their suggestions aligned to my own ideas and goals for what I believe the students needed to be successful during Exploration Time.

Another learning point during my capstone process was the importance of literature. I didn't realize how much I would learn researching during my literature review until I was developing my guidebook. I was very pleased to find the research helpful in outlining the guidebook and highlight important sections that leads the students in a fluid process during Exploration Time. The next section describes my research findings and how it helped me identify key points for understanding my research question and how to analyze possible solutions.

Revisiting the Literature Review

When I began my literature review, I knew I wanted to focus on Makerspace. Although creating and allowing students to explore is not a new trend, Makerspace and the Maker Movement became highlighted in 2014 by President Barack Obama where he challenged the nation to commit into the movement in attempt to encourage more STEM and real-world solutions ("FactSheet: New," 2016). An interesting find with researching Makerspace was the 'newness' of information that was presented for the topic. With the idea of Makerspace being relative new, researching how Makerspace has impacted schools was a challenge. There were many articles that focused on how to implement, few that presented qualitative data supporting how Makerspace connects to student thinking. While Makerspace stems from previous implemented ideas such as Fab Lab, there were not many theories that support Makerspace as a learning environment. The strongest theory that connected to Makerspace was Constructionism, a learning theory that is student centered and focuses on students creating based on their

knowledge (Martinez, 2013). Again, because Constructionism is relatively new, people often mistake it with Constructivism, the most commonly known learning theory based by Jean Piaget. While peers reviewed my chapters, many seemed confused with the two theories. While Constructivism is a solid learning theory more commonly known, Constructionism is more specific for Makerspace.

As I dove into learning more about Makerspace, an important discovery during my early research was Genius Hour. Although my intention from the beginning was to set up a structure for Exploration Time, Genius Hour provided a more defined outline where students could work with the project of their choice yet have guidelines during their process. Although Genius Hour proved to be important, as I research more about the topic, I learned that Genius Hour is more relevant to the advanced population of students that can be self-guided and can problem solve at an independent level. Another finding with the concept of Genius Hour was that the level of interest or topic would already be identified, and the student would mostly be interested in starting the process of creating a product. Based on my experience with students, I knew that would be a challenge for some. Reflecting on my finding while researching Genius Hour, I knew I needed to be mindful of developing a guidebook that provided opportunity for students to find their interests as well as have enough structure to guide them in creating a successful product.

Another component in which I wanted to learn more was the connecting Makerspace and Multiple Intelligence. I felt it important to understand the student's thought process in order to guide them through finding their interests and work on their project. To focus on finding the student interests, I decided to couple Makerspace with Howard Gardner's Multiple Intelligence theory in hopes to set up the space for Exploration Time in a purposeful way to include all Multiple Intelligences. Combining the two was intended to create an environment conducive to

all students' intellectual needs. Researching Multiple Intelligence and researching the different materials that may be used in a Makerspace environment proved to be fruitful. Through various articles of how Makerspace is implemented in a school environment, Multiple Intelligence can be nurtured without having to create a separate environment for individual intelligences.

Through my literature research, I also learned about the critical, creative, and design thinking skills. Although all three thinking skills have a commonality of identifying students' assessment of a situation, each thinking skill offers subtle differences that make the thinking process unique based on the individual student's intention and project. Critical thinking is to reflect in a reasonable way and decide what the next step should be (Ennis, 1996). Creative thinking not only reflects but asks what is missing and what can be done leading more into creating a product than just analyzing the problem (Drapeau, 2014). Design thinking is more going in with a specific intention of creating a solution to a defined problem (Bell, 2008).

Reflecting on the thinking skills, my original intention was to pinpoint each thinking skill and establish the process. Upon learning more about the thinking skills, my belief shifted to guiding the student into working with the project once the interest has been identified. To break apart each thinking skills during Exploration Time would be a difficult challenge as the thinking skills often overlap when creating and developing a product. The student working with their project will touch on the different thinking skills and strengthen all three by following the structure that was designed in the guidebook.

Benefits and Limitations

My journey in working with my capstone began with my passion for allowing students to define their interests and create a product based on their interests. When I was a new teacher I struggled with teaching to the test. As I grew as a professional educator I realized that it was no

longer necessary. Teach students what they are interested in and they retain more of the knowledge. As teachers, we have the commitment of teaching our students relevant standards and ensuring we are preparing them to be productive citizens that can contribute in a positive way in our society. By establishing a specific time (Exploration Time), students can have a set time to learn their interests and strive to create a project that is meaningful for them. A great benefit of implementing Exploration Time in the classroom is that it allows students to learn at their pace while being guided by their interests. When a student is given a choice of their learning, they are more willing to put more effort to produce quality results and take ownership of their learning.

From the educators' perspective a possible limitation is setting a dedicated time for Exploration Time. With the demands of teaching, having an assigned time once a week may prove to be a challenge. If a teacher is not used to the set structure, Exploration Time might seem intimidating. Teaching styles might also play a role in making Exploration Time successful. Although most research indicates that student centered learning is important for project-based learning, if a teacher is used to having all the answers, Exploration Time might be a challenge to allow students to experience failure without the ability to help and provide definite specific answers. The guidebook is intended to provide a framework, but it is not intended to find solutions to specific student questions related to their topic. Teachers must be willing to learn at the same time the students are going through the process. Failure may be uncomfortable if one is not used to it. Although failure may be seen as a limitation, it can also be seen as a benefit allowing for growth and knowledge of what can be done and what cannot. Allowing teachers and students to fail gives them an opportunity to reevaluate their progress and consider possible solutions.

A limitation that can occur during this phase is having appropriate materials and knowing when exploration is not productive. In the guidebook, it does address Phase One, however, it is up to the teacher's discretion to determine if the student is losing sight of the purpose of finding their interests and needs to find the need to move on to another part of Makerspace. Since moving to the next phase must be approved by the teacher, the teacher must feel comfortable in recognizing their student's need to explore and move on. Some students need a specific set of time to explore and find their interest while others need a longer period. As teachers, for the most part, we want our students to be productive, but defining 'productive' in Phase One is not as clear. With time, the teacher will find a balance for exploration and the need to move on; however, this may not be as obvious in the beginning of implementing Exploration Time. Once a student has identified an interest and is allowed to move on to the rest of the phases, the teacher must also be aware of the student's interest in all phases. A Non-Completion page is included in the guidebook to allow students to close their project if they can no longer proceed. However, it is up to the teacher to know when to encourage them to continue or when to allow the termination of the project.

Next Steps

The guidebook developed for Exploration Time will be presented to my director by the end of this academic year. My proposal will be to present the guidebook to our school staff in the beginning of the 2018-2019 academic year. I am proposing to use a two-hour block of our staff development week to present Exploration Time and how to use the guidebook. It is my intention to focus on how our Makerspace is set up, what teachers can do to implement in our own school and provide some guidelines that allow students to explore and create a project. Although the guidebook is written with a 5th grade class in mind, my goal is to include lower grade teachers

(kindergarten - third) and help them navigate through the phases and make it grade level appropriate. The guidebook was written with the intention of providing a concise structure in which a teacher as well as the student using the guidebook can navigate in an easy to use format. I do plan on implementing Exploration Time in my 2018-2019 academic year.

Future Projects

Creating a guidebook for Exploration Time was a result of my question, *how does allowing Exploration Time in the classroom affect students' thinking skills?* It was important for me to define Exploration Time as a specific time in which students are allowed to find their interests and work on a project based on that interest. During my process in learning more about how to set up Exploration Time and help students navigate their progress, my ideas changed as I researched and learned more about my topic. One challenge was to identify the assessment component during Exploration Time. Understanding how important assessment is in growing thinking skills, I found it difficult to identify a specific assessment tool that would be easy to use and aligned to the phases with enough flexibility to allow a variety of topics and projects. A possible future project is to develop more assessment tools that would identify the thinking skills in the phases.

Another future project would be to make the guidebook more friendly and easy-to-use for all grade levels. When I originally began my capstone, I focused solely on my own students. Although my guidebook is intended to be used in my own classroom, I also see the benefit in implementing Exploration Time in all grade levels. Although I do plan on helping my fellow teachers at my school, the need to revise the guidebook to have it grade level appropriate is strong. My hope is to ask my fellow teachers in assistance to ensure all grade levels are represented.

Summary

When I began exploring my capstone I knew I was interested in identifying and working with students' strengths. Through my experience as teacher, I struggled defining what that truly meant. With my investigation through the capstone process, I focused on defining how I could establish a time and place for my students to work on their interests and strengths. Through research and experience, my idea to create a specific time called Exploration Time was born. Understanding the fundamentals of Makerspace, Genius Hour and the critical, creative, and design thinking skills were crucial in helping me develop Exploration Time into an environment where students explore, define their interests and have their ideas come to fruition. Phase One sets the foundation for exploration. In Phase One, students follow the Makerspace philosophy aligned with activities that nurture the different multiple intelligences. Once the student identifies an interest, students move on to Phase Two, which is Research. In Phase Two, students find out more about their topic and create a question that can lead in developing a product. Phase Three is the development of the product using the Design Thinking Process. Phase Four is the presentational and reflection section where students share their product with an audience and reflect on the process. My hope in creating the guidebook was to develop a book that any teacher can follow and implement. Although the guidebook offers a framework to both teachers and students, it offers enough flexibility, so the teachers can share their own interest and create Exploration Time in a way that is meaningful to students as well as themselves.

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