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THE STUDENT LED MAKERSPACE: HOW STUDENTS TRANSFORM
THEIR LEARNING THROUGH EXPLORATIVE PLAY

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Submitted in partial fulfillment
Of the requirements for the degree of
Master of Education
Moravian College Bethlehem, Pennsylvania
2018

ABSTRACT

This teacher action research study explored Makerspace programming within the elementary library Media Center setting when students are the creators of their own learning, exploration and creativity. Twenty-Six fifth grade students participated in the action research study which was conducted in a suburban elementary school with approximately 570 students in grades Kindergarten through fifth grade in northeastern Pennsylvania. Methods of collecting data included observational field logs, participatory and non-participatory observations student interviews, surveys, and photographs of students using the Makerspace. The process of analyzing data was comprised of qualitative coding, creation of theme statements and analysis through the lenses of educational theorists Dewey, Delpit, and Freire. Students were given open exploration time and choice of activities within the Makerspace program over a ten week period. Students took charge of their own learning, explorative play and problem solving. The findings suggest that when students are given a choice and voice in creating their own Makerspace program through explorative play they will work together to problem solve, have open discussions with each other, and ultimately engage deliberately in learning in a way that best serves each student. All of the participants within the study reported positive feelings of accomplishment with the Makerspace program and the activities they experienced.

ACKNOWLEDGEMENTS

First I would like to thank Mr. Timothy Chorones for taking a chance on a new media specialist who just wanted to learn how to use all of the Makerspace “stuff”. I would also like to thank the fifth graders in Mr. Creamer’s class for being open and willing to try something different with a brand new teacher. I would not know how to do many activities within our Makerspace without all of your help. A huge thank you goes to Dr. Shosh for believing in me when I didn’t believe in myself or my writing. There were times I was sure that you were the one dragging me to the “top of my mountain”. Thank you to my classmates Lauren, Melissa, Steve, Katie, Shawn, and Amanda for always being there talk with, to commiserate with and lend support that we were all going to make it through. To my amazing family, you have always supported me in my dreams and aspirations and for that I am grateful. Your constant enthusiasm and positivity helped me more than you will ever know. To my couch writing buddy Mookie, your snoring was the soundtrack for my writing and taking you for a walk was always a welcome break from the computer. And finally to my husband Eric, your support, love, and sometimes obnoxious pushy-ness was just what I needed. I love you and thank you for always challenging me to be a better person and teacher.

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RESEARCHER STANCE

About Me

I have been a school librarian for eight years, the last five of these at a local public high school. Prior to this, I spent one year at a private Catholic elementary school and also one year at the elementary level. Most recently I have obtained a new position as the K-5th grade library media specialist at a local elementary school. This is where I feel that my heart truly lies and I am so excited to be able to have the opportunity to go back to teaching elementary aged students.

As I reflect upon my history as a learner, I would say that I was a good student but not necessarily a great student. I was always the quiet student in the back of the class who would be reading during any free time we might have had instead of talking with friends. I excelled in college because I was enjoying what I was learning. My love of reading drove me to become a librarian/teacher. Of course, I didn't always love reading and even struggled with it a bit in elementary and middle school, but then something clicked in high school, and I just couldn't get enough books to read each week. I'm sure that my mother spent hundreds of dollars taking me to the bookstore. I still fondly recall a high school project where we had to interview people about jobs that we might be interested in pursuing. I interviewed my high school librarian, and she totally sold me on the career,

proudly claiming that the librarian had the best job in any school, that the library was the heart and hub of the school where everyone wanted to be. I knew that I wanted to help instill the passion and love for reading that I had developed.

The Why

I became a librarian because I love reading, and I want to have my students love reading as well. I feel, though, that the role of the librarian is changing in our technological age and that supporting students in the use of Makerspaces, technology, and digital innovation have in many ways become the primary role of a librarian. I have learned that my new elementary school already has a very prominent Makerspace program in their Media Center, which has been running for two years. I want to learn how to use all of the Makerspace tools, resources, and technology that the elementary Media Center has to offer as well as adding to the program so that all of the students and staff at the school will benefit from the program. Hence, the current 5th grade students will help me learn how to use these Makerspace activities and resources.

I have always believed that everyone has the capacity to learn, but students need to learn in the way that is best for them. What might be good for one student may not be good for another. Maybe even the traditional school may not be the right setting for some students. Students also need the opportunity to learn about what they are interested in. I think that it is difficult in today's public schools to be able to create this atmosphere of inquiry due to all of the high stakes

tests that students are required to take. I also think that eventually students will be able to choose the path of learning that will set them up for future success even if that means that they are learning a trade, and not just being prepared for a college experience after high school. Students should be learning valuable information that will be relevant to their lives after high school. This could be setting them up to enter the workforce, military, college, or even just necessary life skills. I am excited by the fact that the Makerspace program at my new elementary school gives students the opportunity for hands-on learning, where they can play with Legos, Keva blocks, or robots; do some coding, print their own books, edit software for movies they might have created, and so much more. The emphasis on learning through play is a huge concept in the Makerspace movement, and I find this concept is a great way for students to find out how they learn best. Having students direct their own learning through exploration is something that I very much believe in. This concept of students directing their own learning through hands on experiences is what I hope to achieve through my action research project. I also hope that giving students the chance to show the teacher how to use these tools and activities in the Makerspace program will help students learn how others can learn best. The Makerspace movement in school library Media Centers is one that is still a relatively new concept. In creating this action research project and asking the question, how does the teacher foster the love of learning through hands-on Makerspace learning activities while engaging students, is important in

many ways. These hands-on learning and exploration experiences will allow students to problem solve, be creative, think outside of the box, use electronic and other media forms all the while learning and becoming actively engaged in what they are doing while in the Media Center. This will allow all students to learn and achieve in the way that is best for them to succeed outside of the school environment.

The What

I want the Makerspace program to be a place where students can be innovative, creative, have fun, and explore without worrying about what grade they are going to receive at the end. The Makerspace will be a time of the day for students to play, relieve stress, and explore ideas and activities that they may not get to in their everyday classroom experiences. This form of curriculum or (null) is what I hope to achieve through my action research project.

My Hope

I hope that the library Media Center becomes a more engaging, student centered area. I want to learn how to use the Makerspace tools and activities so that the students have more of an opportunity to learn and grow the program since it started two years ago. I want it to be more of a time that the students in 5th grade can come and learn something new or even have time to show their creativity and their passions. Some students might not have the skills to sit quietly and listen to stories or do traditional “seat work”; with the Makerspace program

the 5th grade students will be able to show their talents and “teach the teacher” instead of the ones being taught. By learning which Makerspace activities and programs the students enjoy and learn from the most I can base my decisions on future purchases for the program. I like the idea of the students being the ones who are teaching me. Often they are always told what to do and this time with my action research I can see how students respond to teaching not only the teacher, but also their peers. I hope that the Makerspace program increases student learning and engagement through the use of the Makerspace with activities, projects, and interactive programs. I want to make our elementary library Media Center a more interactive engaging place for student learning and creativity.

Research Question

What are the observed and reported experiences of a 5th grade classes Makerspace program in the elementary Media Center, when it is self-interest guided, explorative (non curriculum related) and used to engage in meaningful play?

RESEARCH DESIGN AND METHODOLOGY

Participant Profile and School Demographic Information

This action research study took place in a suburban school district in eastern Pennsylvania. The district is comprised of one high school serving grades 9-12, two middle schools with grades 6-8, and eight elementary schools serving grades K-5. This action research project was completed at one of the eight elementary schools with approximately 570 students. The school is comprised of 28% minority students, with the majority of these students being Hispanic. This elementary school is eligible for Title I services, which means that a majority of students come from lower income families and receive supplemental reading instruction through this government program.

The action research project was focused in the library Media Center at the elementary school level. I focused this action research particularly to one 5th grade classroom during their Media Center time. The “encore” or special subjects are taught on a rotating four day cycle. In a five day week there is the potential to see a class two times on the rotating schedule. The particular 5th grade class that was used for this project has a classroom door that is connected to the Media Center. The school’s entire 5th grade enrollment is spread among three individual classes compared to other grade levels in which there are four or five classes per grade. The class used for my action research study is comprised of nine female and seventeen male students, aged ten and eleven years old. The 5th grade

students in this class have had Makerspace instruction for the past two years and were chosen because they are the most familiar with the resources, activities, and programming already in place within the Media Center Makerspace.

Planned Intervention

In order to answer my research question I needed to first understand the students' prior knowledge of the current Makerspace in the Media Center. All of the current Makerspace activities and tools that are in the Media Center were purchased and implemented by the media specialist before me, so it was crucial for me to understand what the students already knew how to do, and what they still wanted to learn. I wanted to discover those programs and activities they enjoyed most and which ones they still wanted to learn more about. Since I was the one who was more unfamiliar with the Makerspace, I worked to ensure that the basis of my project and research would be student guided and directed. Directing the students to self-guide and choose what they do each session in the Makerspace will allow them freedom to explore and learn from each other without the worry of failing. Learning the impact of the null or void curriculum of open exploration was the ultimate goal of my teacher action research study. With such high stakes testing done elsewhere, providing the students an environment where they are free to explore, make mistakes and "play" was also a key objective. To gather data, I'd used formal observations of students while they were in the Makerspace in the Media Center, taking note of how they problem

solved, worked together, interacted, played, learned, explored and grew through the various activities that are established from previous years using the Makerspace. Giving the 5th grade students the opportunity to learn from each other and explore activities that they have not had a chance to learn yet was an additional goal. This intervention of allowing student choice to direct Makerspace learning without the underlying stress of an assessment was important to me as a teacher researcher.

Trustworthiness Statement

To ensure trustworthiness with students, parents, and staff of my school, I asked student subjects, whose parents have given written consent to participate in the study, an assent form and student interest survey prior to starting the action research. There are no names or identifiers on the survey. Throughout the running of the Makerspace program in the library I interviewed students but did not include names. I have identified students by gender and grade (i.e. Female, 5th grade). All interviews, and surveys were done on a purely on a volunteer basis. Any student who uses the Makerspace when in the Media Center for their “encore” class, had the right to not participate in an interview. Students were made aware that while they used the Makerspace I would be taking observational notes but would not include any identifying factors of individual students. Students were recruited by already being students in the 5th grade who are at the Media Center for their encore time each week. Students were informed in class

and through the letter of consent that they would not be personally identified. I also let the students and teachers know at the beginning of each Makerspace session that I am recording numbers of use, and conducting interviews with students at the start, middle and end of the program. They were also aware that I am recording observational notes, throughout each Makerspace session. All data that I collected was kept in a password protected computer, as well as password protected Google Drive file that only I had access to. Any logs or observational notes that are written down, were kept in my desk or back office/storage room which is not accessible to students. There are no names, or identifying information that was kept in the data collection. After the research was completed the surveys and interviews were destroyed and deleted by shredding. Once all the data has been collected it was filed on the computer in my Google Drive which was password protected. There was no need to inform students of available support services due to the topic and nature of the research study. However if a need arose students were to be directed to the guidance department at the school. Any students who may be uncomfortable talking to me about the research were encouraged to utilize the school's guidance services. To minimize the risk to students no names ages, or gender were identified by surveys or interview results. Students were given a number from 1-10 for each period so student 1-1 would be from period 1 and the first student interviewed. It would go on from that pattern in each period of the school day.

I utilized a teacher inquiry group to ensure research and observations are free of bias and are done in a consistent manner. As I gathered and analyzed the data I took into account unexpected findings. As a peer group we discussed note taking, field notes, and data collection strategies that best reflect the data that was being collected. Throughout our study we continually met with our peer inquiry groups to reflect on bias that may have appeared throughout the research process. Member checks and peer debriefing were two different ways that I helped to ensure that my data collection and research was free of any potential biases. When dealing with potential biases it is important to keep an open mind about how students learn which is individual to each student. Makerspaces at a glance often look like just “play”. It was important for me as a teacher researcher, to have made sure that I was keeping my own biases out of the equation when students were participating in the Makerspace time when in the Media Center. Being open to different types of activities, as well as students who may not want to participate in the Makerspace was also a way to keep in mind different interpretations that could have come up throughout the research. This type of negative case analysis was also important to include in creating validity and credibility to my research. Looking into why Makerspaces might not work for students in learning was also important to include in my research to get an alternate point of view so as to not be one sided.

Throughout the action research study I was reflecting on actions taken

during the study and changing various parts of the study when needed. This was done through the process of using thick description and ongoing reflective planning. I also utilized ongoing reflection to change strategies and address any bias that appeared in the data collection, as I continued to monitor the research in an ongoing process. Using the peer inquiry groups to receive multiple opinions on the research study and reflections throughout the research process is an important ethical practice when doing action research. We have collaborated as a group to brainstorm ways to alter the intervention plan if it is not working, and celebrated successes in the research process. I made sure that ultimately I am creating and participating in an action research study that benefited the students at my elementary school in the Media Center. The Media Center Makerspace that was established became my own through this research process. I was learning right alongside the 5th grade students to help them engage and learn from the Makerspace activities and their peers. Based on the research process and what I learned, I still would like to add to the Makerspace program based on the activities that the students enjoy the most, as well as what helps the students learn in ways that are individually best for each student.

HSIRB Process

Going through the HSIRB process was at first a little intimidating. Having never performed action research or really any formal research before I was unsure of myself and my methods. As I got further along in the process, however, I felt

better organized in how I was to collect data and ensure that the data would be kept confidential. Once I submitted my HSIRB form I did have to make a few small changes to ensure that the data would be reliable, trustworthy and valid. Student identities are kept private, so that the students could feel free to be open with me without the fear of judgement or recourse. Having the HSIRB process complete and behind me it was now time to focus on how I would be collecting my data for this research in my school.

Field Log

Using a field log was imperative to my research. Given the nature of my study it was important to write down as much information of what I saw from students while they were in the Makerspace program in the Media Center. Since I was also actively participating with the students during the Makerspace time it was easy to get caught up in the activities and programs that were going on throughout the space. Luckily, I had a prep period right after the fifth grade class. This way I was able to use to write down anything and everything that I saw, heard, learned, and explored during each Makerspace session. When I was not actively participating myself I was also able to observe and take notes during the actual Makerspace time when the students were there. This proved to provide some of my best data and from which I learned the most. My field log held all of the data collection tools that I needed, including formal observations and notes about the students and Makerspace sessions themselves. Instances of student interviews, whether

they were on the spot quick questions pertaining to what they were doing at the moment or more formal interviews that used a previously established line of questions were also part of my field log. Collecting student work in the form of photographs and video of students in the Makerspace was also a daily part of data collection and in my field log. To maintain student anonymity, I blurred out identifying features, when appropriate. A post survey was also given to students at the conclusion of the formal data collection which was also included in my field log.

Observational Methods

Within the field log, observational data was of primary importance. After all, since the basis of my research was student interaction through play, my main form of data collection was observation. After every Makerspace session with this fifth grade class I would run to my office and write down everything that I saw and heard while the students were there. There were also many times when I was able to be a non- participant observer and watch students and their interactions during Makerspace time. This was imperative when documenting what students say and how they learn, grow, and explore with each other. Just being able to walk around the Media Center while they were in various Makerspace stations was a great way to observe students for my data collection. Talking to students while they were active in the Makerspace was also a great tool for data collection which leads to interviewing and surveying students.

Interview/Survey Methods

When interviewing students I often felt like it was more important to talk to them while they were in the Makerspace activity itself. This was so that I could get a real time reaction from students about how they felt right at that moment when they were learning and creating. There were some moments when I would pull a student to do a formal interview when I needed expanded thoughts and feelings about something we did that day. However most of my interviews were done right at the moment when it felt the most natural for both the students and myself in regards to the Makerspace and the learning that was going on at that moment. Since I started a little late in this process with this new position I was not able to give a pre-study survey to students before we started our time in the Makerspace. I was, however, able to create and distribute a post survey to gauge how the students felt after the Makerspace sessions we had completed for my formal study. Since the Makerspace is an ongoing program in our Media Center, the post survey was used to gauge student reactions thus far with how we have been using it, as well as how to improve on it in the future.

Student Work Collection

Throughout the data collection period, I was able to photograph and video students for social media on my media specialist account for my school district. To maintain students' anonymity when those data were used for this action research project, I removed identifying characteristics. Students often ask when

they are building with the Keva planks, or creating a Lego tower for me to take their picture. This is in part because they know that what they create will not last past the Makerspace time for that day. There are always other classes that will be using the same materials and so we must limit what is created and done to the one time each session that they have for Makerspace allotment. Collecting the students' thoughts and feelings while they were working in the Makerspace with each other was also a great way to describe student work for my research project. How they felt about open Makerspace time, learning from each other, and what they would like to see added provided invaluable research data.

LITERATURE REVIEW

Introduction

When someone inevitably asks me, “What do you do, shush people all day?” when I tell them I am a librarian, I want to explode with all of the amazing accomplishments my students achieve in our contemporary Media Center. Gone are the days of a stuffy old librarian with her cardigan, tight bun and glasses silencing students. Yes, the library is still a place to house and check out books and materials, but it is now also so much more. There are still lessons on the Dewey decimal system, identifying fiction and nonfiction, and, of course, opportunities to connect students with good books and to read stories aloud, but there is a whole new approach to these lessons. I have learned firsthand the value of allowing time for students to learn, create, explore, and play with the Makerspace tools and programs that allow them to think deeply and perhaps differently than in their typical classroom setting. With the ever-changing role of school libraries and the position of school librarians it is now time to address these changes that have been and always will be happening. In her article “Defining Makerspaces: What the research says” Diana Rendina (2015) defines the Makerspace as “a place where students can gather to create, invent, tinker, explore and discover using a variety of tools and materials” (Defining Makerspaces, 2015). This is the definition that subscribes to the idea that libraries and Media Centers are evolving into places where these Makerspaces can exist.

This new idea and theory is why there is a need for change within the school library Media Center.

The need for change

There has been a radical change in the role of the school librarian due to increasing technology in the information age. Wine (2016) describes the four historic changes in school libraries, including the development of school library standards, the impact of a centralized school library staff on student learning, major funds being credited to school library programs, and finally more funding provided through the Elementary & Secondary Education Act, which helped to increase the number of school libraries and certified school librarians.

Moorefield-Lang (2105) also describe how libraries have changed, noting that “While core values may not have changed, roles, jobs, and expectations have...traditional roles of librarianship can be the foundation to build new skills upon. As new roles arise, as new skills and duties are achieved, look toward the future but remain grounded in the core skills learned in the schools of library science” (p.108). This speaks to “core skills” teaching students to think outside of the box. It also encourages them to try new activities and programs. This is at the core of what the school library has stood for. Makerspaces are the perfect example of how to meet the new role and future of the school library. Libraries and Media Centers have to stay current and relevant.

How we can bring about this change

Moorefield-Lang (2015) also describes perfectly the ever present change in libraries, adding, “Librarians are continuously asked to look to the newest technologies and be knowledgeable in the latest trends. They are technology leaders of their schools...” (p.108). Hence, they must constantly be looking for ways to improve and change the library to meet the needs of students and staff. Rendina (2015) states, “While it might vary from one person to the next, most would agree that one of the main missions of the library has always been to make resources and materials accessible to all, regardless of socioeconomic status, intelligence, status (gifted, special education, etc), gender, etc.”(Why should Makerspaces be in the library?, 2015). In the past twenty years the change in library spaces has also come to include digital resources. These resources are, computers connected to the internet, databases, eBooks, and other web-based tools. Due to this new evolution there is now a need for tools that inspire creation. The Makerspace and the resources it holds are used in ways so that students can explore and research. In this way it makes total sense for the Makerspace to be accessed through the library for students as the change emerges. (Rendina, 2015). This change and forward thinking is just what Media Center’s need to help this change happen. To stay relevant and successful, libraries must not be rooted in the past as just being a depository for books and other materials, but a place where innovation, technology, creativity, and hands-on learning are at the

forefront. Moving forward to bring about the change needed in the contemporary school library Media Center, there are three components that seem to be at the heart of this movement, most importantly the concept of Makerspaces. Inside of these Makerspaces are then the concepts of technology, and inquiry.

The Makerspace

Makerspaces are designed to fully engage students with our state of the art library Media Center space, thereby increasing our school's use of inquiry-based teaching practices, technology integration, and student collaboration, engagement and choice. Definitions of Makerspace are broad and show the need for this type of programming in school library Media Centers. Graves (2014) says, "Put simply: a Makerspace is a place where makers can envision a project, find an expert, and create something." (p. 8). It is important to note that quotation included the words "create something". The Makerspace in our school library should be a place where students can design and create all based on their own interests. It should also be noted that, "Makerspaces take many forms but generally involve a physical space with shared resources to pursue technical projects of personal interest with the support of a maker community." (Oliver, 2016, p.160). Creating a community is crucial here because it involves the personal interest factor, and making sure the students feel that they are part of something, which is what will drive the Makerspace from the start. The argument can be made in favor of the Makerspace because it can also be related to the

standards for school library Media Centers, “Making is an inquiry-driven social activity that allows students to develop the very same skills, dispositions, responsibilities, and strategies touted in the AASL’s 21st Century Standards.” (Canino-Fluit, 2014, p.21). The brand new AASL standards released in fall of 2017 adhere to four main “Domains and Competencies” these are “Think, Create, Share and Grow”. For example in the standards under the headings Create and Explore is the standard “Learners construct new knowledge by: 1. Problem solving through cycles of design, implementation, and reflection. 2. Persisting through self-directed pursuits by tinkering and making.” (AASL-Learner-Framework-Spreadsheet, 2017-2018). This is important to include for two reasons. First, Makerspaces are “inquiry driven” and are a “social activity.” Inquiry is another important factor to explore within the Makerspace movement because students are not always asked to pursue inquiry based on choice. Social activity is also important to the action research study because often students do not have time during the school day to engage socially with each other besides in the hallways and during a short lunch period. Elementary school students especially are more often than not asked to be quiet and do not have many options to be social with each other during the school day. The Makerspace is the way for library media programs to stay relevant, current and at the cutting edge of what schools are striving for: “A Makerspace is an evolutionary step in library facilities design and programming. It is a

destination for thinking, learning, doing, creating, producing, and sharing; a space that takes advantage... It is a place to reinvent old ideas with new conceptual frameworks, utilize advancements in thinking and doing..." (Loertscher, D. V., Preddy, L., & Derry, B., 2013, p. 41). This line of thinking is so important when so many programs in schools are driven by test scores and student performance data. Giving students the opportunity to fail, explore, and create all while learning in a way that is best for each individual student is the opposite of how they are learning in the typical classroom setting. When looking at thinking, learning, doing, creating etc. as well as utilizing multiple resources and areas in which students learn in the media center, this is what the Makerspace programming in libraries hopes to achieve. When looking at these multiple examples of Makerspaces it is also equally valuable to look at Makerspaces as an actual program that school libraries can employ. This is where my next section of the literature review will focus on.

Makerspaces as a Program

The Makerspace movement as a program is one that is not only in school libraries. Halverson & Sheridan (2014) describe this movement as "refers broadly to the growing number of people who are engaged in the creative production of artifacts in their daily lives and who find physical and digital forums to share their processes and products with others" (p. 496). The authors also describe how Makerspaces allow the students to move freely throughout the space. Then as a

result of this the analysis is not directly tied to the individual learner but what happens inside of this space. After this is done then one can focus on how to design the space for an open learning environment for all student learners. (Halverson & Sheridan, 2014 p.502). Throughout my research I have come across many versions of Makerspace programs. When looking specifically at school library Makerspace programs Moorefield-Lang (2015) states “Making is an activity that encourages students and patrons to use the library in a new way: to create, use, and share” (p.107). Implementing Makerspaces in libraries takes a lot of planning and training on the part of the librarian as well as students. “These are not library services that come standard and rarely do librarians enter with full knowledge or background in making, hacking, inventing, crafting, or 3d printing” (Moorefield-Lang, 2015, p.108). When looking to move forward with the school Makerspace it is very important to focus on the technology within the Makerspace, inquiry driven activities, and student engagement and choice. These are the lead examples of why we are doing what we are doing with this research.

Technology

In many respects, the technology of the day has always been at the forefront of what drives instruction for school librarians. Graves (2014) notes, “We want our students to develop problem-solving skills and become engaged with making technology, not just using it” (p.8). Clearly, it’s important that students are not viewed simply as users of computers and the internet. When you look at the

technology related to the Makerspace movement it is not always cut and dry. Technology here could mean arts and crafts, drawing, or Chromebooks to run internet programming. Graves goes on to state, “When the library becomes a space to tinker with inventive ideas and dabble with technology and electronics it becomes not only a place to learn, but also a place to create.” (Graves, 2014, p.13) This tells us that technology in Makerspace programs should essentially be about. In his article *WHY Makerspaces ARE THE KEY TO INNOVATION* Matthew Lynch describes the mindset of the technology that can be found in the Makerspace movement, “...mindset that brings together individuals around a range of activities, including textile craft, robotics, cooking, wood-crafts, electronics, digital fabrication, mechanical repair, or creation — in short, making nearly anything.”(Lynch, 2017). This focus on hands-on creative learning is one of the reasons why Makerspaces are seen by educators as being a key to innovation and an ideal method for equipping students to succeed in the future. “The underlying goal of a Makerspace is to encourage innovation and creativity through the use of technology-to offer a place where anything from STEM learning to critical expression to future start-ups can be nurtured.” (Bowler, 2014, p.59). The goal is to eventually include STEM and STEAM into our school Makerspace program. The technology that one brings into the Makerspace program can vary from school to school. This all depends on the budget and student interests. According to the literature there is no specific list of technology

that is “required” for every Makerspace. Using what you have is a great way to start. The internet and chromebooks can provide students with coding applications, games, and creative outlets. Moving forward adding in making sets, codable robots, iPad applications even 3D printing can all be great uses for technology within the Makerspace. School’s that lack the “technology” can still use the Makerspace mindset of learning through doing with crafts, games, and building materials. All of these resources can be considered technology within the Makerspace movement. When students and staff are using technology to guide learning in the library it is important to also think about what processes guide that learning. Here is where the next important theme and argument comes into play in regards to how school libraries are changing, and that is inquiry.

Inquiry

Inquiry is another way to motivate students through Makerspace programing, when looking at the changing landscape of school libraries. Inquiry is what drives all of the activities and programs surrounding school Makerspaces. As related to Makerspaces we define inquiry as “The maker movement is about teaching and learning that is focused on student centered inquiry. This is not the project done at the end of a unit of learning, but the actual vehicle and purpose of the learning.” This is the perfect starting example of what all school library programs should be about, not just Makerspaces but the general drive to seek out information, knowledge and truth to better oneself. When looking at inquiry as

related to Makerspaces and why it is important for students we see that, “Making is an inquiry-driven social activity that allows students to develop the very same skills...” (Canino-Fluit, 2014, p.21). This links making and inquiry together. This is important because with inquiry within the Makerspace it guides students to, become lifelong learners. The students are then able to identify a problem, and figure out a way to solve that problem through experimentation and research. (Canino-Fluit, 2014, p.21). It is important to note because the process of inquiry applies directly to Makerspace programs. Students also must have the training and resources to engage in the inquiry process, “I remind myself that this is about them finding the problems they want to solve and not me dictating what they should learn.” (Canino-Fluit, 2014, p.26). This demonstrates and shows the need for the process of inquiry and having students find out information on their own. The Makerspace in the school library “is a more focused, dedicated, and intentional effort blending creativity, inquiry, and kinesthetics” (Loertscher et al. 2013, p. 48). Combining inquiry with how one establishes learning will create a specific type of Makerspace for students. Now is the time for librarians to embrace the fast paced changes that are happening within their careers: “At the present time, teacher librarians can embrace the opportunities provided in this informal learning environment by creating space and tools for it and encouraging this idea, whether it is embedded in the curriculum or intellectual enrichment” (Loertscher et al. 2013, p. 51). We often describe the process of student led

inquiry and how to provide these opportunities for students in relation to regular classroom teachers. The librarians should be the ones at the outset of student led inquiry. When looking at inquiry it is a “big” term that can be overused in some educational settings. However throughout the process of looking at creating a school Makerspace that is based on student inquiry is what other established programs always come back to. Using inquiry to drive Makerspaces leads us to student engagement and choice which is at the heart of Makerspace learning programs.

Student Engagement and Choice

Student Engagement

When the argument is made for programming for school library Makerspaces student engagement is a key factor into designing the activities, goals, and tools to include. Student engagement is a key component for Makerspace programs because it is at the center of how the program is run. Making sure that students are actively engaged while they are in my school library is a core aspect of my action research. Having students become active participants in their own learning about topics that interest them is what I want student engagement to look like in our school library. Looking at what others have said about this, there are many Makerspace articles that also talk about the need for students to become engaged. “...but it’s the experimentation, the challenge of learning something new and the push to grow professionally that moves her to inspire her students.”

(Barack, 2015, p.38) This is a demonstration of the challenge of learning new concepts, not just because the students will be getting a grade, but to grow as a student and learner. “Making at the library is about offering your students opportunities to move from simply being users and consumers into people who can make things that work better for them.” (Canino-Fluit, 2014, pp. 21-2). This is important to the research because it demonstrates that student engagement can come from students making and not just consuming information like they are used to doing in the classroom. We then go on to look at, “...providing students space and resources and inviting them to experiment, we can empower them to think of themselves as something other than consumers.” (Canino-Fluit, 2014, p.22). This demonstrates that students taking action into their own learning then become engaged through experimentation. When we look at what we want a Makerspace to do for students we say that, “Through actively engaging in the Makerspace patrons take command of their own learning...” (Loertscher et al. 2013, p.41) This describes perfectly student engagement through a Makerspace program. The ultimate goal of the Makerspace is to engage students in ways that best serve them as a learner. We also look at “...the central reason to have a Makerspace in the library learning commons: it is the place where young people can excel at being independent, learning autonomously, and doing unofficial and un assigned learning.” (Loertscher et al. 2013, p.42) This is just as important as well for making sure that the Makerspace program is mainly about student

engagement. “The hands-on learning-by-doing experiences afforded by Makerspaces implicitly require a design approach to problem solving.” (Bowler, 2014, p.60). Student engagement through problem solving and hands-on-learning is what a Makerspace program is all about. The next argument of having student choice can be tied into student engagement; it is also important to leave it as its own term to define different aspects of a Makerspace program and what I hope to achieve for my own school library Makerspace program when it is implemented.

Student Choice

Student choice goes hand in hand with student engagement. Ultimately this is what I hope to give students in my school library. The choice to learn, explore, engage with, and create materials that they find interesting. “To facilitate students’ developing curiosity about the world around them, educators including school librarians, must encourage students to see themselves as curators of their own learning.” (Graves, 2014, p.10) This demonstrates student choice because it is showing that we must encourage students to choose what they want to learn about, and through Makerspace programs we hope to make this happen. The way to make student choice a priority is, “The key to successful workshops was letting the teens choose what workshops we should hold” (Graves, 2014, p.10). The success of the program will come from letting the students have a voice and choice in what kinds of programs and workshops they create and participate in. “Everything I do wraps around that student voice and giving them a choice to

discover who they are.” (Barack, 2015, p.38). Making sure that students have a voice and a say in what goes into the Makerspace is an integral part of the program. “In a Makerspace, students learn for their own reasons and acquire skills to further their personal purposes. They explore their creative potential. The informal learning...encourages students to learn about topics of personal interest, gather new skills to serve those interests, and create imaginative possibilities for the future.” (Kurti, Kurti, D. & Fleming, L., 2014, p.55). This line of thinking can be applied to both student choice as well as engagement. This is because it describes both personal purposes, and learning for their own reasons (the students). In looking at student choice within Makerspace programming it is an important theory that will help signify the research as unique and the guiding factor for the implementation of the program at my school.

Conclusion

Makerspace programs both in and outside of school libraries are used as tools for people to become independent thinkers, creators, innovators, hackers, coders, and so much more. Establishing a student centered Makerspace in the elementary school library will give students the opportunity to become one or all of those qualities listed above. In a school district that places high value and stress on students to perform well on standardized tests having a place even once a week where students can learn about what interests them is what Makerspaces achieve. It is important that students focus on grades and their future after their schooling

ends, but it is just as equally important that these students are provided with opportunities to learn and explore. Makerspaces use the students to direct their own learning based on interests and needs. Through the use of the inquiry based method of learning, students become engaged with problem solving, collaboration, and various new and different aspects of technology. Makerspaces are the rising future of the school Library Media Center. They address the need for change. This change is brought on through using technology, inquiry, and student voice. Makerspaces are designed as a place where students can feel free to explore, learn, and grow as a person without the worry of failure. The literature suggests students need a new and vibrant Media Center, not one rooted in the past, but one that helps to shape their future as learners. Makerspaces are shown to be places of creativity, enthusiasm for learning, and where students not only have a voice but also a choice in how and what they learn. New and emerging technology helps to guide the way in many of these related aspects to help the students through this process. The Makerspace as demonstrated in the literature will serve as the spring board to engage students through their own independent learning experiences in the Media Center.

THE STORY

The Beginning of a new Adventure

Having worked for five years at a small urban high school as the librarian, I applied this past summer for my current position to become an elementary school librarian in a public school district recognized for being supportive of its teachers and students, and also for having cutting edge technology programs. Moving forward with the interview process and getting to know the school and district, I was so pleased to learn that the elementary school where I would be assigned already had a very prominent Makerspace program established. Letting my future principal know that it was my professional goal to expand Makerspace activities might have just sealed the deal.

I was pleased to begin my new position in early October of 2017 and immediately took on the task of hosting the PTO's first book fair in the Media Center during my second week on the job. Introductions and getting to know you activities were my top priorities with my new students in grades K-5, and, especially because I was starting a month into the school year, I knew it was important to establish procedures and build a positive rapport with students before beginning an action research project. After the book fair was completed, I began to formulate how I would start the action research process in a brand new school. My predecessor who had initiated the Makerspace program was innovative and created a wonderful program with 3D printer and even robots in support of

student building and coding. My task was to not only learn how to use these materials but also to find a way to engage the students to make use of the space in ways that went beyond what they had already done. Below is a photograph of the current Makerspace set-up in the Media Center where all of the materials are stored. You can see how many different activities and programs are currently in place.



Figure 1. Makerspace shelving and storage area.

In previous years the 5th grade students would work independently on a chromebook to complete library curriculum through a personalized learning network called Schoology. After the students completed what was required of

them that day they would then be allowed to work in the Makerspace on anything that was open and available to them. To develop the program as more than a “reward” to one of *learning through open play* was something that I knew I wanted to accomplish. Looking to the students for help was my main and first idea. What would it look like if together students and I were learning how to use these materials? How would the students respond if they were in charge of their own learning? Would they be open to learning and problem solving with each other? As I began to learn more about the students, it seemed the most logical choice for me to learn from the very 5th grade students who had already been engaged in the school’s Makerspace environment during the previous two years. They were also mature enough to understand the importance of our project and how we could improve student learning in the Makerspace for the rest of the school. In narrowing down the process even further, I chose the 5th grade class that actually has its classroom directly next to the Media Center. Students can enter and exit the Media Center freely through a door with a direct link to the Media Center. These students were the first ones to volunteer to help their teacher and me with the morning announcements live TV show that he and I were in charge of. This class's classroom teacher was also more than willing to help with any of the technology or aspects of the program with which the students and I had trouble with. This particular fifth grade class was eager to learn, explore, experiment and willing to help not only each other but their new library media

teacher in the Makerspace. All that was left to do before actually diving into the Makerspace programming was to talk to the students in more detail about the project, and to get the official consent form from my principal, the students and their parents.

October 10th 2017 (Introduction to the Project)

This was the first day that I formally introduced the action research project to the 5th grade class. We took most of the class period after book check out to discuss in an open forum setting what the project would look like for both the students as well as myself. I told the students that just like them I go to school. Some students were shocked:

“Mrs. Budge why do you have to go to school when you are already a teacher?” I told them that it was important for teachers to keep on learning so that they can provide the students with the newest and best learning opportunities. I then described the main aspects of the Makerspace with them. I told them that we would be holding weekly Makerspace sessions in the Media Center just as they had done before in previous years. This year, however, I explained that I wanted to learn from them. I wanted to learn what Makerspace programs and activities they enjoyed the most, how they problem solved when something didn't work, as well as how they could help me to understand how most of the items in the Makerspace worked. Of course, after the initial shock wore off that I, too, was in school, the first question that many of the students wanted to know was if

participating in a teacher action research study would require any more “work” for them. I explained that it would be no more work than any other Makerspace session that they had participated in during past school years. This meant that all I expected of them was to use the various Makerspace sessions just like they did in the past except that I would be taking notes and watching how they acted while they were doing this. The students were also concerned if my project would have any effect on their library Media Center grade, which I assured them that it would not. It was the students’ and their parents’ choice as to whether or not they would serve as research study participants. I also had to explain clearly that even if they did not participate in the research study, they still would be allowed to use the Makerspace along with everyone else. After I had done my part in discussing the basis of my project and addressed the top questions from the students I wanted to hear more from them about their prior experience in the school’s Makerspace program.

“What are your favorite activities we currently have in the Makerspace?”

Students eagerly and quickly responded, “Dash & Dot, VR Goggles, and Keva Planks.” “Can you tell me more about the dash and dot?”

Alec explained, “The dash and dot are robots you control with the iPad.”

Dwight added, “You get to race them around the Media Center and knock stuff over with it that they are building.” This caused quite an uproar from

students, all vying to explain to me what they were not supposed to do with the dash and dot robots.

From there I asked another student about the VR Goggles. Alice “You use an old iPhone and can look around at stuff like you are on a roller coaster or in the jungle.” I think that Alice’s response to my question was pretty interesting. This is because this unnatural world of virtual reality is completely natural to today's students. This particular student thought that this brief explanation was all that was needed for me to understand what she meant. However for most adults unfamiliar with this new technology further emphasis and explication on what this student meant would be needed.

Following Alice’s explanation, I asked the students, “What does VR stand for?” After some discussion, they agreed that a Virtual Reality headset acts as the goggles.

Lastly on their top favorites list was the Keva planks, which could simply be described as one student put it “wooden blocks you use to build stuff with. “I could tell right away that the students lit up when talking about the Makerspace and they were very eager to get started with the various activities that it held. It was important for them to know that they would continue to have fun, while I would be learning from their Makerspace exploration..

I let the students know that I would need their parents’ permission for them to be “officially” part of my study, and at the end of the class period this

week, I gave the parent consent forms to their classroom teacher. He helped me in collecting them in the following weeks. Once nearly all of the parent consent forms had been returned, we would begin our first Makerspace session in the library as part of the research project.

October 20th 2017

This day was the next time that I saw the 5th grade class after explaining the project to them. Students had some more follow up questions when I began talking to them about our research together, reminding them that we had talked about it the week before. They were still concerned about the extra work that might be required of them and had some anxieties about participating in the research process. I again reassured them that I would “just be taking notes and talking to them while they are in the Makerspace in the Media Center.” We discussed some of the areas of the Makerspace that they wanted to use the most and what they wanted to use it for. I asked them what they did with the Makerspaces in the past years. One student offered, “We just played around and switched in centers.”

Another explained, “Some of us were on a competition team and we coded the dash and dot to go around mazes and stuff.”

I also had the students explain the different sections of the shelves where the Makerspace items were during this class session. They explained how the shelves held different building activities like Kenx, Keva planks, and Lego

building sets of famous buildings around the world. Then some other students showed which programs needed an iPad or iPhone to be able to work. These were the dash and dot robots, Osmo that comes with different iPad games, and the virtual reality headset... This is exactly what I was looking for and hoping would happen. I wanted students to take charge of their own learning, initially by showing me what they enjoyed doing and how they approached doing so. The students enjoyed the fact that they were teaching me something new and were surprised to learn that there was something that I as the teacher did not know. One student exclaimed, “Mrs. Budge, you really don’t know how to use this stuff?!”

Another stated, “We like getting to show you what to do! This is awesome.”

“Can we do this more often? We can teach you how to code with dash and dot, if you like.”

After the students were done showing their fellow students and me many of the different activities within the Makerspace shelves, I brought them back together to explain the student assent form. There was a table comprised of five to six boys who decided together that they did not want to sign the student assent form. When I asked them why, they shrugged and said, “I just don’t want to”. I again reminded them that in no way would they be identified, and that whether they opted to serve as research study participants or not, they still would be active in the Makerspace for each session we had in the Media Center. Their classroom

teacher was a bit surprised as well when I discussed it with him and offered to chat with his class as well about my project and hopefully help the students to understand further what the goal was in having the students sign the assent forms. I informed the students at the end of the class period before they left that the next time they came to media we would be having our first Makerspace session. This was met with a resounding “yay,” and students began excitedly talking about which programs and activities they wanted to explore the following week when we got started, which had me feeling hopeful for what was to come in our first session the following week.

November 11th 2017

Our first week of actual Makerspace had arrived. Before diving right into the Makerspace session, the students needed to finish scary story writing from the previous week. Even though I wanted to get right into the Makerspace, the students requested time first to finish their stories. Looking into this further for next year, I realize that the scary story writing could also be used as a form of Makerspace exploration. Yes, there was indeed a given prompt, but after that, the students were allowed free range to write whatever they wanted, and this free exploration is the entire point of Makerspaces in school Media Centers. Giving the students freedom to figure out where they are stuck or where they need to learn something more before they can move forward is a crucial learning opportunity in its own right. After devoting half of the forty five minute period to

finishing and sharing their stories with the class, we then dove into our first Makerspace exploration. First, though, I had to establish some rules and procedures. In the past the students had free range of the Media Center during the Makerspace sessions. This meant coming back behind the circulation desks and even into the back office where my assistant and I have our desks. The students were also allowed to just take whatever they wanted from our shelves where the Makerspace materials are kept in any manner. I wanted to make sure that even though this was a free and open time for students to be in the Makerspace that there were still some necessary procedures they were to follow while participating.

To begin, I gave the students choices of what they were going to do in the Makerspace for this class period, including Dash and Dot, Osmo, Keva Planks and Legos. I wanted students to have the opportunity to engage in activities with both technology driven materials and ones that did not require any technology but relied instead upon on building and imagination. I first let the students know what the day's choices were, and when I was met with some sighs, I assured the students that as we moved forward we would be allowing more and more materials during each class. I chose to randomly assign students for each activity if they had their hands raised when I announced it. The dash and dot required I pads to work, so students needed to work in pairs and share. I had eight students working on the Dash and Dot coding robots for this session. The Osmo also

required an Ipad, and for this session there were three students who explored with this material. All of the building materials were free for any of the students who chose to do so because we have two separate Lego tables and a large story time area where the Keva planks can be used. Once the students all got into their groups, they were able to get going right away without much input from me. It took a few minutes for some students to connect the right dash to the right iPad, but when they had it figured out, they were zooming the robots around the tables of the Media Center. The Keva plank students were constructing buildings, spirals, and various creative structures. There was a brochure that was inside of the Keva plank bin and the students were using it for reference to what they would build with the planks. (See Image 2 & 3 below).



Figure 2. Students construct a structure out of Keva Planks together.

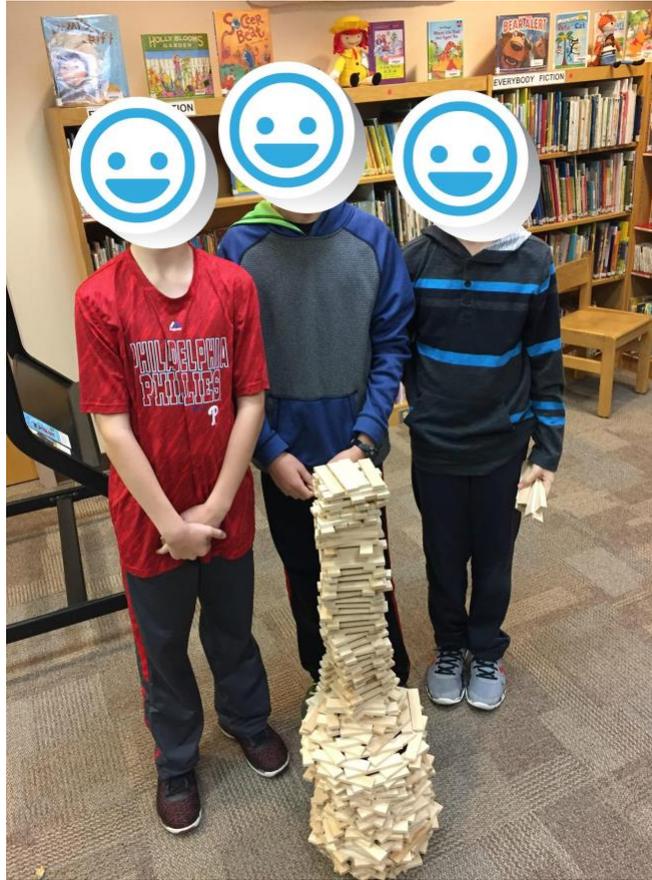


Figure 3. Students standing with the structure they built during the Makerspace session on November 11th 2017.

While observing and talking with students I also wanted to ask them what other activities they enjoyed in the Makerspace that we were not using for this session.

One student immediately spoke up, “We like the VR Goggles!”

I asked her “What do the VR Goggles do?”

She replied, “You can take tours of space, and the ocean and stuff like that. You need a phone to work it, though.” We do have use of an old non-networked iPhone, which I assumed was for the Virtual Reality goggles the students were telling me about.

Another student asked, “Could we do geoguessr and sumo paint?”

I had no idea what she meant so I asked, “What is that?” She replied “You do them on the chromebooks. You draw and paint with Sumo Paint, and with geoguessr you can go all around the world and guess where you are.”

I asked “How do you know? Is this something that you have done in the past, like last year?”

The students around replied enthusiastically, “Yea!”

At the end of the class period I explained to the students that next time they came to the Media Center they would be doing different stations. Each time they did Makerspace they would be able to try out something new. I then quickly called roll again from my attendance list to mark off what activity each student had completed that day, as to have a running record to go back to for the following week when I chose the activities and which students did what. I was pleased that our first Makerspace session had gone really well. Of course there were some hiccups getting the students to connect everything to the right robot with Dash and Dot as well as logistical issues that I had to address, but the

students were engaged, active, and learning from one another from the very beginning of the stations. Students who were not chosen to work with the Dash and Dot robots or Osmo coding on the iPad were a great resource for help. When the need arose these students were able to stop what they were doing and come over to help and assist students with the issue they were having. Students were able to then go back to their own activity with a fluid flow throughout the Makerspace time in the Media Center on this day. Before the students left I also thanked them for helping me with learning how to use many of the materials within the Makerspace. I assured them that this was what our research was all about. Students seemed to be relieved and more open to the participation in the research now that they had experienced the first Makerspace session and saw for themselves that it truly did not require any extra effort or work on their part while they were in the Media Center.

November 7th 2017

Moving on within the Media Center's curriculum was also an important factor throughout the duration of my study. Though I wanted our Makerspace programming to be completely open, I still had to allocate time to the curriculum that needs to be addressed for the Media Center. Starting our class session on this day I began with assigning a new Dewey Decimal project to the 5th grade students, a project which would run along-side of our research with Makerspace sessions. The goal of the project was for students to work together collaboratively

to explain a specific section within the Dewey decimal system of books within our library. Though it might seem arbitrary in relation to the work the students are doing in the Makerspace, the Dewey Decimal system is still something that must be taught to students within my school as part of the Library Media Curriculum. In previous years the students were given worksheets to study the various categories of the Dewey Decimal system and then tested on it based on memory. I wanted to create a project that would have a more lasting impact. Rather than just memorizing and then forgetting. This way their fellow students in the class would be explaining what types of books we had in our own library, in each section. Then this would hopefully help the students better remember as well when they are looking for books in the nonfiction section. This was also a way to incorporate the skills of the Makerspace i.e. problem solving, discussion, and creativity within the limits of the project to related to more “real world” school skills, as applying them to an actual project in the Media Center. Students had open access to use Makerspace materials, as they saw fit, for the Dewey project. This meaning that students were allowed to use iMovie, posters, iPads, Chromebooks, and editing software. The students needed an outlet in the project for presenting the project to the entire class at the end. This limited what materials they could use that were located in the Makerspace. On this day with the students I described the project outline and guidelines to them as well as placed them in their assigned groupings. For this project I wanted to make sure that the groupings were evenly distributed

among skill levels. This is so that each group would be able to accomplish the project in a timely and efficient manner. It would be up to them the following class period to choose what type of project they intended to complete for their presentation. Suggested options included a Google slides presentation, iMovie video, Powtoons creation, interactive poster through Glogster, or any other form of presentation tool that they could think of or had experience with.

After explaining the project to the students and putting them into their groups we moved into the Makerspace portion of our class time. Students had to problem solve to figure out how to connect the right dash robot to the correct iPad as well as how to move their dash robots through large block mazes that other students created for them. I was impressed by how all students became involved in the process.

“Mrs. Budge, can we take out the blocks to make a maze for the dash?”

I couldn't resist, wanting to see how the students would work together to figure out how to navigate the robots through tunnels and mazes that they were going to create.



Figure 4. Students create beginning of the maze for Dash robots.

In the background of the above photograph you can also see students working at the table with the Osmo. Students also had to problem solve to open the right app on the Osmo coding iPad app and working together to figure out how to organize the game. The Osmo coding app has many different applications and uses real life pieces to mirror what is happening on the screen of the iPad. There are word, number and geometric shape games among others. The main issue with the Osmo

is that there are not enough Ipads for both the Dash as well as the Osmo, so during this session there were four students each in groups of two using one iPad per group.



Figure 5. Two students using an iPad to play a word game with the Osmo. During this session there were also two students did Legos at the Lego tables. These students can be seen in the background of Figure 4. The two Lego tables were donated by parents as were all of the Legos in the Media Center. The Legos

station provides an important activity most students are familiar with and serves as an important option that is not related to electronic technology. Many students again chose to create and build intricate creations with the Keva planks. The Keva planks, like the Legos, provide a creative outlet for students without the use of technology. The students have voiced throughout this process that they often use technology throughout the school day and like to have the opportunity to “play” with the Keva planks instead of being on the Chromebooks once again. This is because often the students use the Chromebooks for standardized testing within Math and Reading benchmark tests. They also use a Math program on the Chromebooks as a formative assessment tool called ST Math. The students perform many tests, general school work, as well as homework on the Chromebooks on a daily basis. Having the opportunity to essentially “unplug” for a moment allows the students to become engaged with a more hands-on learning style not related to any technology.



Figure 6. Many students working in groups to create different structures with the Keva Planks.



Figure 7. Student colors in adult coloring book.



Figure 8. Students work on Chromebooks with Sumo Paint website.

In relation to figures eight and nine. There are also creative and artistic options in the Makerspace sessions. These can be using our drawing books to create drawings, coloring in adult (more intricate) coloring books, and creating drawings on the Chromebooks with the Sumo Paint website. Within each Makerspace session, there are usually three to four students who choose the artistic activities.

Throughout this process I was writing down each Makerspace activities the students selected each time so that they could rotate through and participate in different stations each time they are in the Makerspace. The students did a good job of sharing the iPad, working together and figuring it out when something wasn't working like it should have. This was one of our best Makerspace sessions to date. The students were open to trying new activities, helping one another work through issues with technology and interacting with each other in a kind, helpful

manner. The students learned to share, cooperate with one another, think creatively to create various structures and drawings, and empower themselves to play openly during the Makerspace time. This was in contrast to our work with our more traditional Dewey Decimal project, where students were working in assigned groups and with a topic that was given to each group. Makerspace in our Media Center is an open independent time where students can play and explore openly. The Dewey Decimal project is structured and is also related to the Media Center curriculum. However, the open student choice piece comes into what type of deliverable the students want to create for their presentations, whereas student choice is what guides the entire Makerspace experience. If I left what we would learn up to the students they would choose open Makerspace sessions every single class. This is not something that could be done due to the required Library Media curriculum that needs to be taught. There are ways that the Makerspace could be tied into the curriculum, however we would then not want the students to have less enjoyment of the Makerspace due to the fact that it is then tied to a grade or project every time they are using it. They would prefer to learn on their own with the various activities that the Makerspace has to offer in our Media Center. Even though they would select Makerspace over the regular library curriculum, they worked hard to make sure that their presentations are covering all of the topics within their assigned sections. This is because they were still given some autonomy in the way that they presented their projects. Like the Makerspace

sessions they still had a choice as to how they would present their section and how each group would divide the work amongst each other. The students it seems would always choose Makerspace because they are given the freedom and choice, whereas typically within the standard curriculum they are not given the choice in what they are to do and learn. With the Dewey Decimal project they were working on a project that was curriculum related but also had aspects woven in where they were free to make choices and decisions that worked best for each group.

November 13th 2017

As students arrived in the Media Center the next week, they went right to work on their Dewey Decimal Projects. I had them pick their way to present their projects for each group from various options (Google slides, Powtoons, iMovie, etc.), and most of the groups chose to do a google slides presentation or Powtoons. Students were familiar with Google slides from in classroom work and previous projects they were required to do for the classroom teacher. Powtoons is an online website where students can add in their own voices to premade cartoons and backgrounds. Students were able to apply skills that they had acquired through previous Makerspace sessions in collaborating together, and working through questions and problems that arose. When a student had a question or did not know how to do something relating to the technology that they were using they would turn to each other for help first. For example connecting the right

Dash robot to the correct iPad was a situation that occurred during each Makerspace session and the students quickly learned to rely on each other to get the connections right before they began. Students in the class were willing to help their classmates when they had a question or needed help to figure something out— just as they did when working in the Makerspace environment. For the final ten minutes of class, students were able to engage in their choice of Makerspace activities, once again opting to build with the Keva Planks and Legos. They were also eager to use the VR Goggles, Dash and Dot and Osmo once again. The issues the students had the first two sessions with connecting the right dash to the correct iPad were once again present since a new group of students was now exploring with these tools. Classmates with prior knowledge were able to help them connect the correct iPad and robot. Figure 9 shows students working in an open area of the Media Center to connect and drive the dash robots.



Figure 9. Students working to connect the right dash robot to the right Ipad and moving them around the Media Center.

Once again, I was most impressed by the maturity, level of patience, and also confidence that students exhibited. At the end of this class period I asked the students for suggestions now that we had engaged in our first few sessions of Makerspace activities.

“It would be cool if we could switch around each time instead of doing the same thing all time.”

“That is a great idea, and we can run it like centers and have everyone switch. What centers do you think we should have for next week?”

Many of the students chimed in right away.

“We should do a building competition between centers with the Keva Planks.”

“How about more dash and dot?”

“Osmo stations!”

I quickly jotted these ideas down with the plan for their next class to continue working on the Dewey decimal project for half of the class period and Makerspace centers/stations for the second half of the class. It was important for the students to have the main voice and choice in deciding what they wanted to do for each station and session with the Makerspace in the Media Center.

November 17th 2017

When the class met again, we were on a half day schedule for parent-teacher conferences, which meant that we had only a thirty five minute period instead of our customary forty-five minutes. This day was the first day that students were actively working on their Dewey decimal projects within their groupings. I was pleased to see some students decide to create an iMovie on the Mac computers that we have in the Media Center. Using technology like iMovie and Powtoons programs students demonstrated the knowledge that they have been learning throughout our Makerspace programming. Using technology for play is then transferred into their school work. The students are becoming more adept at learning new tools, resources, and technologies from the Makerspace which then applies to the Dewey Decimal projects when they encounter something new when

creating the presentations. As students developed their presentations, they were required to problem solve and work together just as much with this project as they do during typical Makerspace time. Most students choose to either produce an iMovie or Google slides presentation. As students worked, questions arose about saving and sharing their projects with their group members. I let their classroom teacher know how well and hard they worked during this time period as well and how proud of them I was. I anticipated that with one or two more working sessions the students will be ready to present their projects to the rest of the class. The skills in problem solving, collaborating together, helping each other with various tools, resources, and all of the Makerspace activities help the students to bring these “soft skills” into the regular classroom and curriculum. Having the skill to think critically to solve a problem without the assistance of the teacher is one that is so necessary when students move on in school but also in life. Much of a student’s schooling is very focused on standardized tests and the scores that come along with them. Test taking skills are rarely of use outside of the school environment. Being able to work well with others, compromise, think critically about problems that arise, and help others are all skills that most jobs after school will require of these students. Yes these students are in 5th grade but if they start to build these skills with free Makerspace play, then adapt them into the how they learn curriculum, they will be able to carry on these skills as they go from grade to grade and one day into the workforce.

With only thirty five minutes to move their projects forward and about ten minutes for library book check out, we did not have the opportunity to move into Makerspace activities during this session. I think that it is important to mention here, too, how scheduling impacts “encore” classes at the elementary level. When the schedule is changed for special events, programming, early dismissals etc., I often will not get to see a certain class or will have only a limited amount of time with them. I made the specific choice to cut our Makerspace time during this class session because I felt that the students were still learning interactively with each other on their projects. I was pleased to see students navigating new computer programs, including Google Slides, iMovie, and Powtoons so well. Students were clearly engaged, learning, and problem solving to figure out the best options for their projects. When a student did not know how to add a new slide or change the font/color of their writing on the Google slides, there was always another student who would come over to assist them. One student who wanted to do an iMovie for their groups’ project was quickly discouraged by their group members. Another student quickly chimed in and said “I can help your group with editing, I learned how to do it last year.” This was not a student in their own group but in a completely different one. This shows how when the students are learning how to help one another during the Makerspace they are then transferring it into their learning within the Dewey Decimal projects.

November 28th 2017

When we met for our next session, the students had to take time out of working on their projects to complete two different unrelated tasks. First, the school district required all students in grades 3-6 to take a survey about technology use. I had the students log-on to the chromebooks and navigate their way to the Destiny homepage to take the technology survey, which took about 10-15 minutes to complete. Then the students needed to navigate to their Clever (all access portal) to make sure that they could log into the Hour of Code website for the National Computer Science Education week hour of code lesson the following week. Most students could easily access this link through Clever, but there were some students who needed additional guidance because they were new to our school this year. After both of these tasks were done the students had the rest of the time to work on their Dewey decimal project. Students were engaged in learning throughout the time they spend working on these projects. They were in the book shelves looking at the specific books within their section. Some were writing scripts for the iMovie they were going to create. They were helping each other figure out the technology piece and some student groups even chose to make a poster and had their creativity shine through drawings of the types of information that could be found in their section. This was another week in our Media Center that students did not have “specific” Makerspace time devoted during their class period. However the use of computer coding and the skills that

go along with coding are all part of our Media Center curriculum and the Makerspace movement. As much as I was disappointed to lose valuable class time, I was also pleased to be able to use the Hour of Code website as part of Computer Science Education Week, which shares many objectives with the Makerspace movement because it is a future-ready initiative for students to think creatively and use the technology in an new and innovative way. In previous years the media specialist was in charge of creating three after school coding events. This year, since I was still new to the school, I had help from two other teachers and the Principal to get the event organized. To participate in the after school sessions the students had to have their parents sign them up through a Google form. We then had three nights during the week where students stayed to participate in the official Hour of Code. Parents were then invited to come and code with their children during the last half hour of the session. In our school, the traditional view of what a “Makerspace” is has been extended into computer science education and has, in this instance, extended beyond the traditional school day. This class was willing and eager to help younger students during the hour of code event, and some even participated in the event themselves outside of what they were able to code in the media classroom the following class period.

December 4th 2017

Our class time for our first scheduled meeting in December was reallocated, with all of the fifth grade classes reporting to the gym to practice for

the chorus concert. All of the encore teachers were there as well to help with student management to assist the music teacher. Fortunately, we still had our after-school Hour of Code events, where many of the research participants assisted the younger grade level students. The students also participated in the coding as well. They were learning how to code using games to enhance the learning. The games ranged from simple drag and drop exercises to coding with Angry Birds, Minecraft, and Flappy Bird. All games that the students are familiar with playing without the coding piece. All of the coding for this event was done through Code.org and each student had access to this with an account that was linked through the school districts all access portal. The students were learning important computer science skills and tools that were relevant to applications, games, and resources that they will use outside of school. Having the 5th grade students being able to help the younger students as well as their fellow classmates allowed them to feel accomplished and like the experts they were in the process of becoming. I asked the various students from this class to volunteer for the Hour of Code events and I actually had so many students volunteer I had to stagger the students over the three nights. Many of the students were always working with the younger students when they had difficulties as well as just being there for support when the other students were doing well with their coding. At the end of the events when the students were waiting to be picked up I asked them what they thought of the event and helping out. One student replied

“It was fun helping the first grade students learn how to code.”

Another stated “I liked that the students could just raise their hand and we were the ones who got to act like the teacher and come over to help.” Many more of the students chimed in and all agreed that they enjoyed the event and liked feeling helpful to the younger students.

One student also said “I don’t like coding when I have to do it but I liked helping the other students how to do it when they got stuck on something.”

The Hour of Code after school events helped students to apply the skills that they were learning in class to an important out of classroom experience. They were also able to practice what they had been learning with other students outside of their own class and that might not have the same set of skills that they had developed. The students in this case had the chance to teach other younger student’s skills and techniques that they have been working on throughout our Makerspace sessions.

December 8th 2017

Normally the class rotation would have allowed us to meet twice during the second week in December, but the choir rehearsal limited us to one class meeting. Our December 8 session was devoted to the Hour of Code workshop. The students logged in through their all access portal Clever and then the official Hour of Code website at Code.org. Each student already had an account created and could finish the online coding material or course that they had previously

been working on either earlier in the week during our after school events or from the previous school year. Hour of Code helps to align with our research and Makerspace programming because often it is included in various Makerspaces as the students are creating various coding events, programs, and activities on the computer as they would do this with real world programs in the actual Makerspace. The students worked on the Hour of Code materials diligently and were very excited about the different topics that the website offered.

“Wow, they have Minecraft?!” exclaimed one student.

Another stated “I didn’t know they had Flappy Bird. I thought that was just a game.”

Many of the Hour of Code activities were based on popular games and apps that the students were already familiar with. I was thrilled that students could explore coding in our Makerspace environment as a great way to tie in STEM. The students did not feel overwhelmed with learning something totally new since it seems like they are “just playing computer games,” as one student exclaimed at the start of our coding in class. I was pleased to see the students problem solve to work through the challenges in the coding process. For example many students would get stuck on a certain coding skill to move their player or to navigate through a maze. The students needed to learn how to work through the coding challenges that arise as they move through the levels in each Hour of Coding segment. As students moved through the different courses and levels, I saw

evidence of higher level thinking when they explored higher levels in the Hour of Code programming and used skills such as problem solving, coding with the applications to learn how to create mazes, code characters into moving through their environment and use typing and internet navigation skills to work through all of the various programs on the Hour of Code and Code.org websites. All of this was done during this class period when the students were participating in the Hour of Code.

December 14th 2017

I began our final class prior to the holiday break by welcoming the students and allowing them to exchange books. After book check out I had the students get into their groups for the Dewey decimal project. The students worked to complete their Google slides, Powtoons or iMovie presentations for half of the forty five minute class period. Almost all of the class was able to work independently and assign different tasks to each group member. One student might be creating the presentation while another was in the shelves of the library looking for specific books to discuss about their section. The students did need some technical questions answered like how to format text within their slide show or how to upload the video they recorded on the iPad onto the iMac for editing. However most of the students were able to help each other with many of the questions that they had. These self-reliant instances were what I was hoping would arise from the Makerspace program and the students in this class definitely

rose to the opportunity with the Dewey Decimal project. This left us with time in the second half of class to have our last open Makerspace session.

“Can we rotate next time we have the whole time for Makerspace?” one student questioned.

“Of course, after all of our presentations are finished, we will take a couple of class periods to do Makerspace the entire time since you all have been working so hard on your projects.”

The students agreed and all happily chose new Makerspace stations. At the end of the class period, students logged on to Google on their Chromebooks to take a survey designed to provide their opinions and feelings on their experiences to date and what they would like to see change when we returned from the upcoming holiday break.

Coming to a Close

As the official research period came to an end, I was eager to examine the survey data from the students. As a whole the students stated that they enjoyed the Makerspace sessions. They asked if they could have more time and move around more often during the sessions as well. The students had some great suggestions as to what to add to the Makerspace, including Ozo Bots (which you code to move along a drawn line with marker), having Dash and Dot competitions to code the robots around mazes, as well as more games and activities that involve the students using the iPads, chromebooks and iMac computers. The survey also

gauged the students' views and opinions on the school. If the students believed that the school provides learning opportunities outside of the classroom environment, if they feel learning and being creative is something that the school values within their students and if they felt the Makerspace program was a valuable use of their time in the Media Center. When it was time for the students to present their projects, I was so impressed. They were able to "sell" their sections and tell the other students in the class about the different subjects of books that can be found in their section. They were well spoken, and I could tell that they had practiced what they wanted to say during their presentations. Some of the groups were a little bit rushed because they wanted to get back to the Makerspace. Students listened to their peers' presentations attentively and asked great questions of their fellow students when they were asked. At the end of the project and when all of the presentations were done, I gave a matching test on the Dewey Decimal system. Over half of the class got eight or more correct in a ten question test. The students were required to match the Dewey Decimal hundreds number with the correct general heading for that section. Even though half of the class got eight or more correct on the ten question test there were only four students in total that would have qualified as "failing" with five or less correct. This shows that overall the class learned the Dewey Decimal hundreds categories through their classmates' presentations. They will be able to remember that

certain books and categories are grouped together when they are searching for books in any library setting in the future.

The hands on learning experience and being in charge of their own learning for both the project as well as Makerspace sessions proved to be such a valuable learning experience for my students as well as myself. As the literature suggests, when students are given the opportunity to guide their own learning and experience, the learning becomes authentic and student centered. Rendina (2015) states “Through making, students are learning vital 21st century skills like innovation, creativity, collaboration and critical thinking. These skills can help increase their success in all classes.” (Rendina, 2015). I learned just as much as the students did, right alongside of them. The students taught me how to use all of the Makerspace activities and to learn from mistakes or setbacks when something does not work right the first time you try it. As we continue to hold Makerspace sessions throughout the rest of the school year I hope that the students continue to learn, grow, explore, and play and that I can be there right alongside of them doing the same.

METHODS OF DATA ANALYSIS

As indicated in the “Methods of Data Collection” section, there were various forms of data that were collected for this research study. All of the sources of data had a specific purpose to determine the learning and growth that was taking place within our school’s Makerspace program. Due to the nature of the research, the analysis of the data was ongoing throughout the entire research process. It was imperative to analyze the data while the research was happening to make changes and adjustments as needed. Hendricks (2009) states, “The analysis of data is an ongoing process that should occur throughout the study rather than at the end of it” (p. 127). Through collecting multiple forms of data, reflecting on observations, interviews, as well as collecting interviews and student surveys, I was able to better understand the Makerspace in our school Media Center and how the null or void curriculum was important to student learning and engagement.

Field Log

My field log served as the primary repository of data for the research. I kept detailed electronic notes on each class session that the 5th grade class was in the Media Center and using the Makerspace program (for ten class sessions). My field log was done in a chronological chart with the date and what we did that day in the Makerspace. I often would circulate around the Media Center while the students were at different Makerspace stations and take observational notes,

record direct quotations, and take photographs of student work to include in my field log. My field log included participant and non-participant observations, quotations, and location information of what was happening inside of the Makerspace stations each class period. The field log provided a inside look into the students' problem solving skills, thoughts, views, feelings, and collaboration with each other. The field log allowed me to navigate through student actions and decisions when they were in the Makerspace as well as look into what was happening throughout the entire Media Center in each session. The field log included general observations about what I was seeing from students while they were interacting in the Makerspace, notes on my thoughts and feelings about what had happened in each session as well as direct quotes from students. Analyzing the field log allowed me to find the important and structural details about the Makerspace program, student interactions, feelings, and how to make changes in the future.

Observations

Observations were done both formally and informally throughout our research process. I used both participant and non-participant observations in each class period and Makerspace session. Observing student groups, creativity, and the various stations of activities during the Makerspace time was invaluable to my research. Analyzing this observational data was important because it allowed me to step back and look just at what I was observing and not what I thought should

happen or felt should happen. Repeated observations allowed me to gauge student interactions and the learning that I saw occurring. Along with the observations, I wrote analytic memos that allowed me to view my observations through the eyes of various educational theorists. Some of these include Dewey, Delpit, and Freire. All of these theorists and the analytic memos that I wrote in relation to their theories, helped me look deeper into my views on education, how students learn, and dive deeper into how each student learns differently.

Coding Data

During the course of my research I analyzed the data contained within my field log to form qualitative codes. In this process I was able to create similar themes, ideas, and patterns. I organized a coding index of similar words and phrases and then placed these codes into “bins” that I created to assist in finding the overarching themes once all the data was coded into these specific phrases and categories. There were many times that a certain code was used more than once within a specific date but I was able to navigate to that date to find the areas where it is mentioned easily within the field log. My coding index helped me to create my bins of similar phrases and terms which then were organized into the main themes that related to original research question and how it had formed and changed over time. These bins and codes then led to specific theme statements or research findings. When looking at the main codes of Student Voice/Choice, Discussion, Engagement, and Problem Solving, I needed to synthesize the coded

data to reveal what students had learned within the Makerspace program. Below is the graphic organizer that I created to help arrange these codes, and bins to ultimately create the theme statements that follow in my research findings.

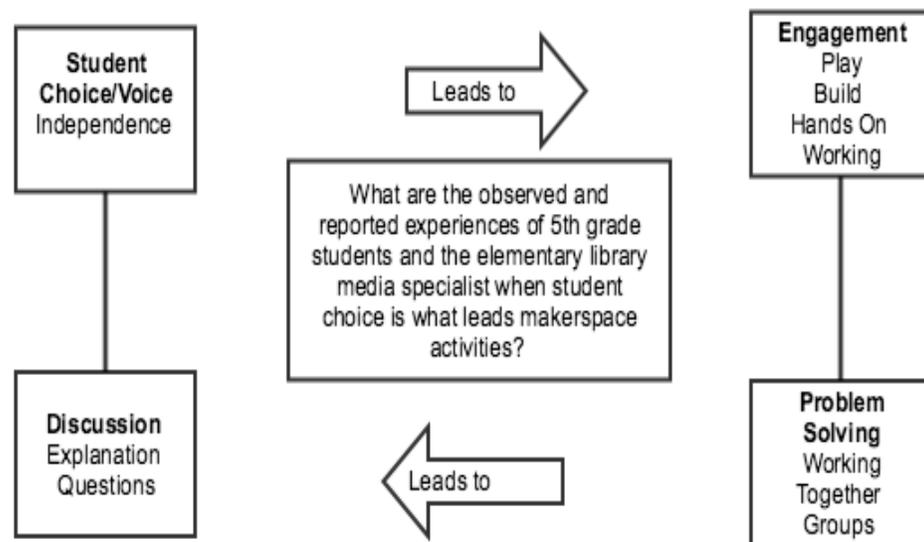


Figure 10. Coding Graphic Organizer

FINDINGS

When all of the data were analyzed I was then able to understand the need for Makerspace programming that is led by the students and in the form of “null curriculum” not related to traditional library curriculum, to help gain understanding of meaningful play and student led exploration. The use of qualitative codes led me to four preliminary themes, including Problem Solving, Student Voice/Choice, Discussion, and Engagement. From these main four thematic topics, I was able to establish theme statements that became clear and could be supported by the research study data. The following are the theme statements and explanations based on the data that was collected throughout the entire research process.

Theme Statements and Explication

(Problem Solving) When 5th grade students are given the opportunity they will work together in groups to problem solve Makerspace activities and projects when in the library Media Center. Students are able to work around technology issues by using different analytical methods to troubleshoot and work these issues to complete the task they want to perform.

From the very beginning in my data collection, it was clear to see that the students were open to working together to problem solve any and all issues that came up during the Makerspace sessions. From connecting the correct iPad to the various robots and coding activities, the students helped each other in all aspects

of the Makerspace, showing and supporting each other without taking over their classmates' activity to ensure that their fellow students were learning how to do it themselves. Initially, students came to me as the teacher for help, but I, like them, was genuinely learning how to use these various technologies. When we, as a small group, could not figure something out, we would ask other students in the class who had used these resources in past years for help. Students felt a sense of pride and self-assurance when they were able to help not only their classmates learn how to do something but also me as the teacher.

As Lisa Delpit (2012) states, "The urgent need for demanding critical thinking of our students exists in all subject areas. Only those who are authentically and critically literate can become the independently thinking citizens required for any society's evolution" (p. 128). Many, if not all, of our Makerspace activities require critical thinking and problem solving. As a teacher, I have attempted to empower my students to have authentic learning experiences and become problem solvers so that they can think for themselves on their journey to becoming a productive member of society. The skills that students demonstrated through the Makerspace program are the same real world problem solving, critical thinking and collaboration skills they will need after their time in school is over. They have to share, work together, figure issues out, and overcome challenges that they might not be used to facing. Having them use technology, building skills and coding all help them to think critically outside of the demands of high stakes

testing that guide instruction most of the school day. Delpit goes on to say, “Successful instruction is constant, rigorous, integrated across disciplines, connected to students’ lived cultures, connected to their intellectual legacies, engaging, and designed for problem solving that is useful beyond the classroom” (p. 69). In our case, the instruction mainly came from fellow students at the point of need, and it was up to me as a teacher to create the structure and environment for the learning to take place within the Makerspace. The learning in this environment was indeed rigorous and relevant. The curriculum was also engaging, using problem solving to aide in student learning, as well as connected to the students’ prior knowledge. All of these skills, resources, and instruction strategies should ultimately be transferable beyond the classroom walls for each student. Having students work in the Makerspace during their library media time has already proven they are using problem solving skills and collaborating to solve specific open-ended problems. The students figured out how to work together and share with the Legos and Keva planks in building different designs and creations. They had to code the Dash and Dot robots to connect to the right iPad to make them move and talk. The students also needed to work together to configure the iPads to match the correct game and activity to match the Osmo program. All of these skills will transfer to the real world outside of school. Teaching to the traditional library curriculum alone would not have provided students with the opportunity to access and build these real life skills. Focusing

the Makerspace curriculum on students and faculty working together to figure out these new and exciting resources provided a real world learning context within the school Media Center.

(Student Voice/Choice) Students become actively engaged in Makerspace programming as well as library media curriculum when they are given a choice about what they are doing, how they are doing it, and the ways in which they may best share their learning with one another.

Giving students autonomy in what and how they learn is another theme that developed when looking at all of the data that were collected over the course of the research process. When the students had the choice to choose what they would participate in for each Makerspace session, they felt empowered because they were selecting something that they enjoyed and found fun. The students had the choice for which activity they did in each session and also knew that they would be able to do a new activity each session or on a rotating basis. This gave them the options to participate in what they wanted, and unlike the regular classroom, they were able to skip past areas or activities that they did not choose to do. Students were also able to have their voices heard. They were able to make suggestions throughout the research process on changes they believed would be good to make. Some of these changes included rotating through stations and not staying with the same activity for the entire Makerspace session. The students also asked to have more involvement with the 3D printer moving forward. These

experiences with both student choice and voice the students were able to take on a different role than is typically seen of 5th grade students. Dewey (1997) states, “When education is based upon experience and educative experience is seen to be a social process, the situation changes radically. The teacher loses the position of external boss or dictator but takes on that of leader of group activities” (p. 59). As Dewey is discussing, when the students’ education is situated around the experience they are having and the collective practice of the students and teacher together, the goal of education changes entirely. He is also stating that when this happens the role of the teachers as the primary expert of “teaching or leading” the students changes to someone who is there to guide students in meaningful experiences and activities. One of the main aspects to my project was having the students take charge of showing me how to use the Makerspace activities they had the choice to learn. The teacher’s role of guiding activities does not necessarily mean that the teacher must possess the expert knowledge of the new tool the student is exploring. In my action research project, students had quality educative experiences through showing each other and the teacher how to use, create, and explore the Makerspace activities within the program, as well as to help design new aspects. The students took ownership of this Makerspace program so that they could learn in various ways that are best for each student individually. When these experiences are meaningful to both the students and teacher, true learning and creation happen authentically. Giving students a voice in what they

participate in through the Makerspace program then leads them to a discussion with their peers as well as the teacher in regards to how they learn best and can move forward with their own learning. The students in this class then felt comfortable enough with each other to discuss any issues that arose, the desire for changes to be made, and their thoughts on the best approach for our school's Makerspace program in the future.

(Discussion) Students feel more open to discussion with their peers as well as the library media specialist when they are in charge of their own learning experiences.

When students are free to voice their opinions about the Makerspace activities and the manner of engagement in those activities, they are more open to form discussions with their classmates and teacher. Entering into a dialogue not only amongst themselves but also with the teacher allows the students to think about their progress within Makerspace and in school as a whole as well.

In his book *Pedagogy of the Oppressed*, Freire (2000) states, "If I do not love the world--if I do not love life--if I do not love people--I cannot enter into a dialogue" (Freire, p. 90). Hence, students must feel comfortable and enjoy what they are doing to be able to freely engage in discussion about what they are learning. This engagement in dialogue is so important for all educators and students. If students and teachers are enjoying and even loving what they are doing, the dialogue naturally and authentically emerges. If you do not love what you are doing, love

your students, and love your content area, you are likely to have difficulty engaging the students in this type of authentic dialogue. I think that everything you do in life should come from love and a passion for what you believe in. My passion is to help students learn, love to read, and explore in ways that are most beneficial to them. Having students take charge of their own learning through the exploration of the Makerspace also helped to instill that passion and love of life for the students and even for me. The love of the world, life and others should always be why you are starting something new that will better not only yourself but your students, school and community. This love for what you are doing and discussing it with your peers will establish critical and independent thinking. Delpit (2012) talks about the need for this type of thinking, too, in her book *Multiplication is for White People* when she says, “The urgent need for demanding critical thinking of our students exists in all subject areas. Only those who are authentically and critically literate can become the independently thinking citizens required for any society’s evolution” (p. 128). Each subject area needs to demand critical thinking from all students. As a teacher you have a key opportunity to empower your students to think for themselves as they prepare to become productive members of society. This is relevant because it shows that the skills my student are learning through the Makerspace program are helping them to develop problem-solving, critical thinking, and collaboration skills they will need after their time in school is over. They have to share, work together, figure

issues out, and overcome challenges that they might not be used to facing. Student lead discussion amongst themselves as well as with me as the teacher flourished within the Makerspace sessions. Students could be heard sharing ideas on how to troubleshoot issues they were having and working through how to construct their structure with the Keva planks. They had open conversations with me about improving the Makerspace sessions each class period. This directly relates to what John Dewey goes on to explain “than its emphasis upon the importance of the participation of the learner in the formation of the purposes which direct his activities in the learning process...” (Ch 6). When students feel open to discuss not only with each other but also with their teacher it shows how important it is for the learner (in this case our students) to have a voice in the discussion. This then creates authentic learning that expresses their opinions, values, and experiences based upon the natural learning process in which this Makerspace environment creates.

(Engagement) When students are left to be independent, active participants within their learning they feel open to explore more choices and engage with fellow students in authentic learning opportunities.

This is possibly the most important theme that was found based on the data from this study. All students within the 5th grade class were completely engaged while participating in each of our Makerspace sessions. Engagement, learning, explorative play, and creativity were all seen in each part of the

Makerspace as well. Too often in teaching, students' engagement with what they are learning is overlooked. As long as students are "passing the test" teachers may not worry about how engaged the students are or concern themselves with whether or not students will retain the information that they are learning after the standardized tests have been administered. Teaching students to become engaged with what they are doing is what our Makerspace sessions hoped to achieve. Dewey (1997) asks, "How many students, for example, were rendered callous to ideas, and how many lost the impetus to learn because of the way in which learning was experienced by them?" (p. 26). Under a test preparation curriculum, students are often passive, non-participatory and lose the drive to learn for the sake of learning, due to the nature of the way they have been taught previously. Past methods of learning may hinder students from wanting to participate in new classroom experiences. This directly relates to my study because the students were able to learn and experience that learning in different ways through the use of the Makerspace in the Media Center. This loss of the desire to learn was changed and reformed by giving students multiple opportunities to engage with the Makerspace program. The engagement came from exploration, teaching their peers as well as the teacher, and finding out different ways that they learn individually. It is also my belief that through these engaging Makerspace experiences and activities the students who might have lost that desire to learn were able to come back to that original "love of learning" because they want to

learn, not because they are required to. It is also important that through the Makerspace program the students were not driven by the desire to earn a specific grade. The engagement came from authentic learning not because the students knew they would be tested at the end of our study. They were having fun and learning at the same time just because they were enjoying the hands-on experiences that they were creating for themselves. The students have a desire to learn, create, and explore through the Makerspace simply to learn and not for the outcome of receiving a grade at the end of each session. This has instilled intrinsic motivation for students who might have lost this internal motivation through previous learning experiences.

Our student engagement theme also comes from the teacher and the students themselves believing they can succeed. When students needed to work together and figure out issues with one another they became more engaged and successful. Delpit speaks to this theme of student success related to engagement. “If we do not recognize the brilliance before us, we cannot help but carry on the stereotypic societal views that these children are somehow damaged goods and that they cannot be expected to succeed” (Delpit, p. 5). Here Delpit is describing what most children must feel at some point within their time in school. We as teachers need to get to know and learn about these children for all of their character traits (good and not so good). They each have something special to bring with them to school. When we do this we will not keep the overused views

that society has for these children. These views are ones that they are somehow already damaged, and not held to high expectations in school because they are not anticipated to achieve. Often there are times that students can “get by” in school without really trying. They “play the game” of school and feel that society has already thrown them away. Through this research the students who feel like this were able to shine with their talents and show their classmates the skills and knowledge they have to share. For example, during one of my first Makerspace sessions with the 5th grade, there was a student who did not really seem engaged and did not want to try any of the activities. She asked me if we had any blank paper and if during this time she could “just draw”. I took this moment to tell her that if drawing was something she enjoyed, then she was more than welcome to draw during Makerspace time. That drawing was just as creative and exploratory as were the building and coding. It is important that the students have the choice to show their talents and explore Makerspace activities that will give them the opportunity to not only shine with their current knowledge but learn new skills as well from their peers. We expect the students to succeed because we know that they can. When the students in this class also believed that they could succeed within the activities and programs in the Makerspace they were more willing to try new activities and listen to each other.

My research started out with the question *What are the observed and reported experiences of a 5th grade classes Makerspace program in the*

elementary Media Center, when it is self-interest guided, explorative (non curriculum related) and used to engage in meaningful play? The above themes of problem solving, student choice and voice, discussion and engagement all help to show what happens when the 5th grade students are in charge of their own learning in the Makerspace. Students are able to problem solve issues that arise. They are proud of the voice they have as well as the choices they are making in regards to how they want the Makerspace to run in our Media Center. Discussion flourishes because they feel empowered through learning in ways that most engage them. When the students are creating experiences that are meaningful to them, they will engage with the program, each other, and their teacher in ways that help them become better lifelong learners.

NEXT STEPS

Moving forward with the Makerspace program throughout the rest of the school year and beyond is a main goal of mine. The students had great suggestions for changes that they would like to see happen based on survey results. Mostly the students wanted more Makerspace sessions with options to rotate through activities like they would during centers in the regular classroom. The students also would like to add new activities, and to have more access to the 3D printer that is currently in the Makerspace.

Looking into new tools, technology, and activities is imperative to keeping this program current and lasting throughout time. Since this was the third year of the program with some of the students but only my first year, this action research was a great starting point for me. As we grow the program and look into adding new resources it is important to note the growing movement in Makerspaces throughout all school and public libraries. As more and more libraries embrace the Makerspace movement, there will be greater opportunities for students to have access to the hands on resources and learning materials.

In our school library Media Center we hope to establish a collaboration between the art class and Media Center with 5th grade students to compete in a 3D printing design contest at the end of the school year as a capstone project for both Art and Media. Relating the Makerspace to the Library Media Curriculum is also an important next step. Having students work in the Makerspace as related to

in class books we have read, or creating projects that relate to their classroom curriculum are both ways that I would like to move forward with the program. Students would also like to have more opportunities to use the iMac and iMovie editing software to create movie projects that relate to curriculum. Students in fourth and fifth grades will be working on a Book talk project using Flipgrid to film their book talk which fellow students will watch. These Makerspace tools and resources are then also tied into the Media Center curriculum. Moving forward I would like to incorporate more of these resources into the Media Center curriculum now that the students and I know how to use them efficiently. Expanding the Makerspace to outside of the Media Center is also a top priority in our next steps as well. I have created a shared document with the teachers at my school and they can then sign out specific Makerspace materials to use within their own classrooms. Some teachers may choose to sign out the materials as related to curriculum that they are teaching, while others may wish to have open explorative play with their students to transfer this learning into the classroom and not just to the Media Center.

As we continue to grow and expand the Makerspace program at our elementary school the need to be open and willing to change and adapt to the students' needs and wants is key. The learning and exploration must be guided by the students, allowing them to be creative, engaged, and explore the passions that they have to transfer the learning outside of the school environment. Looking for

new tools, resources and activities to add to the Makerspace is always a top priority in moving forward as well. Ultimately our next steps for our program are to listen to students, stay current with new and emerging resources and expand the Makerspace throughout the school.

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APPENDICES

Appendix A: Principal Consent Form

October 3rd, 2017

Dear Mr. [REDACTED],

I am currently working towards earning my Master's Degree in Curriculum and Instruction at Moravian College. As part of the program, the college requires I conduct an action research project. The purpose of my study will be to research "What are the observed and reported experiences of a elementary library media specialist and students when an interactive and self interest guided, and explorative (non curriculum related) Makerspace is taught and made open to learning in the Fogelsville Media Center?" The goal of the study is to foster exploration and creativity among the 5th grade students at Fogelsville. The study will also provide information on how students can learn, explore, be creative, and have fun in non-curriculum related activities while in the Media Center.

The data I will be collecting to support this study will come from student surveys, observation of students both participatory and non-participant, as well as formal and informal interviews, while 5th grade students are in the Media Center for their encore classes. Through this study I hope to gain insight as to helping students learn for fun, explore activities and multimedia that they might not have had access to and develop critical thinking skills. I hope to find answers to this question as well as how to promote creativity and exploration in the Media Center among students based on survey and interview information of student needs.

The study will take place from October 2017 until December 2017. The only people who will have access to the data I collect will be myself, my action research committee, the professor of the course at Moravian and fellow students in the class. The students participating will be those who return a parent consent form and are 5th grade students. The students will still be fully engaged in their curriculum and school work while they are in the Media Center and part of the study. The data to be used will only come from research participants that have given consent. There is no mandate for a student to participate in the study and there will be no penalty for those students who opt not to do so. Students may withdraw from the study at any time without penalty. All research materials and data collected will be kept in a secure, locked location outside of the Media Center and will be disposed of after the end of the study. Students who are named in the study will be assigned a pseudonym to ensure confidentiality. I am asking for your permission to use the data gathered.

If you have any questions regarding the study, please feel free to contact me. My professor at Moravian College. He can be reached at Moravian at [REDACTED] or by email [REDACTED]

Please sign and date the form to give your consent to move forward with this study. I would appreciate if the form was returned at your earliest convenience. Thank you for your cooperation and support.

Sincerely,
Caitlin Budge
Library Media Specialist

[REDACTED]
[REDACTED]

Signed _____
Date: _____

Appendix B: (Parent Letter and Consent Form)

Dear Parent/Guardian,

My name is Caitlin Budge and I am the library media specialist at [REDACTED]. I am conducting an action research project this school year that deals with implementing student choice and engagement while using the Makerspace in the Media Center with 5th grade students. A Makerspace is defined as “a place in which people with shared interests, especially in computing or technology, can gather to work on projects while sharing ideas, equipment, and knowledge.”

As part of my action research I am asking for permission to conduct a survey and possibly a follow up interview with your child. The survey and interview information will be on what they would like to see in the Makerspace, what they enjoy most about the Makerspace program, and how to improve engagement. I am hoping that the Makerspace in our Media Center will help to serve students as an engaging, collaborative, and explorative space where students can learn about what they are interested in.

All surveys and interviews will be done on a volunteer basis. No student is required to participate. All of the information gathered from the surveys and interviews will be kept anonymous. The data I collect will only be used for my thesis program at Moravian College. There will be no identification information that will be given out about your child. The survey, interviews and participation in the Makerspace will not have a grade given so there will be no negative impact on your child’s grades. The student is welcome to withdraw from the study at any time without penalty.

I have included a permission slip for your child to be allowed to participate in this study. Thank you very much for your time. Your student’s input will be essential to me in this research. If you have any questions, please do not hesitate to call or email me or [REDACTED]. We would be glad to discuss this research, the surveys, or the Makerspace program with you.

Sincerely,

Caitlin Budge
Library Media Specialist



Parent Consent Form

I, _____ give my permission for my child
_____ to have data collected in school through surveys and
interviews. Data collection will begin in October 2017 and end around December
2017. All data and student information will be kept confidential. I understand that
my child will not be identified in any way. Should you wish to withdraw your
child from participating, you may do so at any time without penalty. This study
will not affect your child's grades in any way. If you have any questions please
contact me at _____ or my phone extension.

Child's Name: _____

Parent Name: _____

Signature: _____

Date: _____

Appendix C: Student Assent Form

I, _____ give my permission for Mrs. Budge to use data collected through surveys, interviews, and observations for her action research Makerspace project.

I understand that I will not be identified in any way. I understand that should I wish to withdraw from her study I may do so at any time without penalty.

I understand that this study will not affect my Media Center grades in any way.

I acknowledge to the best of my ability that I will answer the survey and interview questions with honesty and integrity.

Student Name & Grade: _____

Signature: _____

Date: _____

I am: (Please circle one)

Excited to start this project



Nervous to start this project



Scared to start this project



Appendix D: (Student Interview Questions)

What do you think of the Makerspace program in the library?

What would you do differently?

What would you keep the same?

Please tell me some of your favorite activities/resources in the Makerspace so far?

Please let me know of any other activities/resources you would like to see added to the space?

Please tell me any other thoughts, ideas, comments, or questions you might have about our elementary school Makerspace program.

Appendix E: (Observation Field Notes Log Information)

How many students are using the Makerspace today?

How many different activities are there today?

Number of Males:

Number of Females:

Grade of students:

Number of student working together:

Number of Students working alone:

Most popular activity today:

Appendix F: (Student Post Program Survey)

Please answer the following questions honestly and to the best of your knowledge:

Choose one (Strongly Agree, Somewhat Agree, Somewhat Disagree, and Strongly Disagree)

Our school provides ample opportunities for learning outside the Classroom.

- Strongly Agree
- Somewhat Agree
- Somewhat disagree
- Strongly Disagree

I know how to become more involved in school activities if I were to choose to do so.

- Strongly Agree
- Somewhat Agree
- Somewhat disagree
- Strongly Disagree

I feel that learning, being creative, and exploring are an important part of my school career.

- Strongly Agree
- Somewhat Agree
- Somewhat disagree
- Strongly Disagree

I feel that the school Makerspace program this year was a valuable use of time in the library.

- Strongly Agree
- Somewhat Agree
- Somewhat disagree
- Strongly Disagree

Please List some of your favorite parts/activities of the Makerspace program:

If you did not participate in the Makerspace program in the library please explain why:

If you could do anything differently with the Makerspace program please describe here:

Is the Makerspace program something that should continue in our school library in the future? Please explain your answer:

Please use this section to give Mrs. Budge any other ideas, thoughts, and critiques of the Makerspace program in the library from this year: