The Effect of Makerspaces on Student Engagement as Perceived by Teachers: A Qualitative Research Study

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**Introduction**

Over the years, the teaching and learning process in schools have changed. The way in which instruction was delivered in the past may not be as effective for the student of today. Today, it is recommended for teachers to act as facilitators and for students to take the lead role in the classroom as they work in collaboration with their teachers and peers.

Learning occurs when students are actively engaged with the task assigned through a hands on approach. The classroom environment and the way in which it is designed plays a key role in which students are engaged with the content. Teachers are being encouraged to set up their classrooms with an area or space that allows students to create or “make” and to think critically. Some schools have identified specific rooms that have been renovated as makerspaces to prepare our students for the future by learning through creation, development, and design.

**Statement of the Problem**

“Used by students and staff, makerspaces have become arenas for informal, project-driven, self-directed learning, providing workspace to tinker, try out solutions, and hear input from colleagues with similar interests” (Educause, 2013). Makerspaces provide students with the opportunities to take ownership of their learning as they build a sense of pride through their creations. As students learn through a hands-on design approach, they are exposed to various technologies that increase the development of their problem-solving and engineering skills.

Makerspaces can be used interdisciplinary across content areas to increase the level of student engagement through authentic lessons by enriching the students’ projects and the effectiveness of the makerspace as an innovative educational environment.

According to Phillip Schlechty (2002), engagement results when students are attentive, persistent, and committed. Students value and find meaning in the work and learn what they are expected to learn. The level of student engagement in the academic learning environment and the task assigned to the students is the key to academic achievement in the teaching and learning process. Although there have been many studies on student engagement, its impact on academic achievement, and the various levels of engagement, there have been few to no studies conducted on the how makerspaces increase the levels of student engagement and impact learning.

**Need and Value**

Student engagement is most commonly assessed in the K-12 academic setting through formal teacher observations and walkthroughs. School and central office administrators conduct formal observations through the lens of the Danielson Framework for Teaching, which uses a rubric that focuses on four domains: planning and preparation, classroom environment, instruction, and professional responsibilities. At the highly effective level of the rubric, teachers are expected to play the role of the facilitator throughout the components in each domain, while the students take the lead. One of the most important components in the framework is domain 3C: Engaging Students in Learning, which aims to identify if students are intellectually engaged in the lesson or “on task”.

As schools begin to create makerspaces in their schools, the question rises as to whether or not they increase the level of student engagement that results in student achievement or are they just “fun” and keep students on task.

**Research Questions**

This qualitative study aims to explore the impact that makerspaces have on student engagement as perceived by teachers. This study was designed based on the following three research questions:

1. How do makerspaces influence teaching and learning?
2. What are teachers’ perceptions on makerspaces?
3. What are student perceptions on makerspaces?
4. How do makerspaces increase student engagement?

**Outline of Relevant Literature**

Makerspaces are areas or “spaces” identified for students to learn and share resources through collaboration with peers as they build and engage in creation/design. The makerspace provides students with the space and tools needed to design and construct their innovations.

Teachers acting as facilitators provide students with assistance, but must of the assistance is gained through peer collaboration and student engagement. Makerspaces encourage collaborative learning that has a focus on interpersonal and small group skills as well as creating a sense of accountability (I-Sha, Tiong, and Seng, 2008). Makerspaces provide a learning environment that helps to build strong relationships amongst students and staff, which results in effective teaching and learning.

Effective makerspaces have various items and tools needed to support the design and creativity of the students. Although these items and tools range in cost, it can get costly when outfitting the makerspace with tools such as laser cutters and milling machines. Traditional makerspaces have cost effective three dimensional printers and software along with some form of robotics. “Whatever the supplies, the overarching goal of a makerspace is to be a place where people are free to experiment and make things on their own as part of a productive community” (Johnson, Adams, Estrada, and Freeman, 2015).

 When planning to create a makerspace in a school, a key factors to take into consideration is the supportive environment needed to promote student engagement and academic success. Three aspects that lead to an effective academic environment are the impressions, expectations, leadership.

 **Impression on the Student**

 The way a student is expected to feel about a makerspace lies with the impression that is given. Students should be motivated and inspired to learn and construct through exploration and curiosity. Makerspaces should be created with the end goal being that students are provided with enlightening moments that leave them wondering how specific things happen as they engage in their projects.

 Having fun as students are engaged in makerspaces should be encouraged by teachers. Fun in this context refers to “a social emotional interactive process which deconstructs the social and historical biographical inequalities of lived experience to create a with-equal other

social-human bond” (Podilchak, 1991, p.134). Students can be bashful or have a sense of discouragement to have fun through hands-on learning because this approach is not the typical norm that is experienced in traditional learning environments. Learning through exploration, construct, and play must be promoted as a foundation in a makerspace. Students must be provided with opportunities to display/share their work and receive acknowledgements in order to sustain motivation to learn in makerspaces.

**Expectations for the Student**

 Commonly expressed, failure is not an option in schools. It is not the norm to hear students being told that it is okay to fail. Students are consistently pressured by parents, teachers, and society to succeed academically, as failure is not an option. Effective makerspaces must implement the criteria and expectation that alleviates the pressure placed on students and teaches them that failing the first time is acceptable and at times needed for growth. Students must gain preservice and learn to struggle through the learning process. If they fail, something breaks or does not work, they must have the tenacity and problem-solving skills to identify a solution.

“Educational makerspaces must be failure tolerant, and it would be even better if exploration and productive failure were explicitly encouraged by signs, words, and responses to failure. Big ideas are built on the lessons learned from smaller failures!” (Kurti, Kurti, and Flemming, 2014).

**Leadership**

John Maxwell (2102) states, “Everything rises and falls on leadership”. Leadership has its many challenges and the academic success of a makerspace lies with the leader who creates and manages the space. The leader of the makerspace leaders must never be afraid to fail, must be a critical thinker, and a quick problem solver. The makerspace leader must also be resourceful in their abilities to assist students with the challenges they may face as they construct, but must allow students to struggle and think critically in order to find their own possible solutions. The leader must always work collaboratively with students and colleagues and establish the expectations of the makerspace in order to promote the highest levels of student engagement.

**Student Engagement**

The term engagement and its various definitions has been used in education for a long time. In this study engagement will be referred to as “the heightened simultaneous experience of concentration, interest, and enjoyment in the task at hand” (Shernoff, 2013, p. 12) and the level of affective, behavioral, and cognitive involvement during a task (Connell & Wellborn, 1991).

Engagement occurs when "students make a psychological investment in learning. They try hard to learn what school offers. They take pride not simply in earning the formal indicators of success (grades), but in understanding the material and incorporating or internalizing it in their lives (Newman, 1992, pg. 2-3).

 To effectively engage a student in the academic environment, teachers must first understand that all are unique and have a diverse set of learning needs. Once the teacher demonstrates knowledge of their students, they can begin to plan, prepare, and design coherent instruction that will provide students with the opportunities to be engaged in the lesson at the highest levels.

Phillp Schlechty’s Center on Engagement places a focus on the alignment of student motivation and the lesson designed that is presented to the student. The manner in which the lesson is designed and presented results in the investment and students’ motivation with the lesson. Schlechty identifies five levels of engagement as a result of student involvement with the task assigned. The five levels of student engagement are as follows:

1. Engagement (Authentic) – Student has a connection with the lesson and views it as purposeful. Student shows great interest and shows perseverance despite difficulty.
2. Strategic Compliance – Student has no connection with the work and replaces their personal goals with the goal of the assignment. Completion of the work is for a good grade, to graduate, or to make parents happy.
3. Ritual Compliance - Student has no connection with the work or with any goals. Student does not seek confrontation and simply does the work to comply. Investment in the work is at the lowest level.
4. Retreatism – Student is disconnected from the work and all activities and shows no emotional connection to anything. No participation from the student.
5. Rebellion – Student is disruptive and rebels from doing any work. Student is not engaged with any of the classroom activities and have their own personal agenda.

Schlechty’s levels of engagement inform teachers that the level of engagement with the lessons can be enhanced by planning, preparing, and designing coherent instruction that takes into consideration the needs and interests of their students.

**Methodology**

The qualitative methods approach to research explores a problem and develops an understanding of a social or human issue. Data is collected from words of a small group of individuals so that the views of the participants are identified. Qualitative research is used most appropriately to address a research problem in which you do not know the variables and need to explore (Creswell, 2015). This qualitative study will used interviews, observations, and questionnaires to explore the impact that makerspaces have on student engagement as perceived by teachers.

A constructivist grounded theory design will provide the framework for this study as it relies on the views, values, and beliefs of individuals rather than the gather of facts (Charmaz, 2006). This study will explore themes that may arise from a case study design involving 56 seventh grade general science students and two teachers who will be using a makerspace for the first time.

**Population**

 The participants for this study were teachers and students. The seventh grade math and science classes were the selected population for this study, which is comprised of 150 students. This study was comprised of two groups of teachers, one who taught Math and the other taught science. These teachers were divided and grouped on the basis on their experience with a makerspace. The researcher selected purposeful sampling for this study as it is often used in qualitative research for the identification and selection of information-rich cases for the most effective use of limited resources (Patton, 2002). Purposeful sampling involves the identification and selection of individuals/groups that are knowledgeable about or experienced with a specific interest (Cresswell & Plano Clark, 2011).

**Procedures**

 This study will collected data through various instruments and methods such as teacher interviews, student interviews, and observations (See Appendixes). The data collection is anticipated to take eight weeks. Once approval has been granted to begin the study, the researcher will be begin the study by conducting two sets of interviews, one for the teachers and a random selection for the students. The researcher will then conduct three sets of observations biweekly throughout the daily to collect data on the level of student engagement. During the last two weeks, of the study a second round of interviews will be conducted based on the results of the observations and results of the first round of interviews. The observation data will then be coded using the observation sheet to identify themes amongst the observations. All of the interview responses will interpreted and analyzed in preparation for a final report that will answer the research question posed on the impact that makerspaces have on student engagement as perceived by teachers along with its influence on teaching and learning.

**Potential Risks**

 Possible limitations or problems that may occur in the study teacher bias. The teachers’ experiences and perceptions on the topic of study may have an impact on the participants’ interpretations and responses to the study. A second potential limitation is not receiving approval to conduct the observations and interviews in a timely manner. A delay in approval will dramatically change the timeline and completion of the study. Lastly, a third limitation may be a lack of student participants. Some parents may not want their children to participate interviews or observations of a study for various. Since these students are minors, parental consent is needed for them to be interviewed or observed.

**Timeline of Qualitative Study**

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| Fall 2018 | Steps in Conducting a Qualitative Study |
| November | Identify possible dissertation topic. Research information that supports the value of the study and why it is needed (dissertations, journals, articles, etc.) |
| Spring 2019 March - May | Create an outline of the key topics to be discussed and determine the population and sample size |
| August  | Obtain NJCU IRB Approval for the study |
| September  | Obtain approval from Superintendent of Schools and/or Board of Education to conduct study |
| OctoberNovemberDecember | Selection of teachers and students for open ended interviewsReceive permission from Superintendent, teachers, and parentsDistribute and collect results from participants  |
| 2020 |  |
| January - Feb | Conduct observations, interviews, and surveysAnalyze and code the findings, identify themes |
| MarchApril | Write report and complete dissertation Defend dissertation  |
| May | Graduate |

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**Appendix A: Teacher Interview Questions**

1. What is your definition of student engagement?
2. How would you define a makerspace?
3. What are some similarities and differences in student engagement while learning in a makerspace versus a traditional classroom?
4. How would you describe your experience with makerspaces?
5. Describe how you would use a makerspace environment to raise the level of student engagement in your class?
6. How do you assess the students’ level of engagement when in a makerspace environment?
7. Describe the advantages and disadvantages of a makerspace to increase the level of student engagement.

**Appendix B: Student Interview Questions**

1. Do you have a personal connection with the lessons that your teacher presents on a daily basis?
2. Do you find the lessons that are presented to you to be meaningful and purposeful?
3. Why do you think your teacher uses the makerspace to teach certain lessons?
4. What are some advantages and disadvantages of using the makerspace?
5. How are you engaged with your classmates when learning in the makerspace?
6. Do you feel that the makerspace allows you to understand your lessons more? Why or Why not?
7. What do you like most about learning in a makerspace environment?

Appendix C: Observation Sheet

Teacher name \_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

Observation Start/Finish Time \_\_\_\_\_\_\_\_\_\_\_ \_\_ Grade Level\_\_\_\_\_\_\_\_

Number of Students \_\_\_\_\_\_\_\_\_\_\_\_ Subject \_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| Themes | Codes |
| Authentic Engagement | AE |
| Strategic Compliance | SC |
| Ritual Compliance | RC |
| Retreatism | RET |
| Rebellion | REB |
| Student Collaboration | SC |