

Motivation of University Students & Makerspace

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## **Chapter I Introduction**

### **Introduction**

The growing concern that university students are not prepared enough for the global technological workforce due to lack of preparation and the call for the need to evaluate the STEM curriculum (Hira, & Hynes, 2018). The university is looking toward the makerspace environment as a solution to enhance the STEM curriculum offering. Even university students are feeling that their education is not doing enough for them to be confident of the necessary skills and knowledge desired in the work environment from a recent survey done by Gallup and Strada Education Network (Pringle, 2018). Students enroll in the university looking forward to getting a better job after graduation, but only 34 percent of students feel the university is doing enough to prepare them for their career (Pringle, 2018).

Many university's curricula favor a liberal education compare to a one that involves workforce training; a disadvantage to students if the curriculum is too narrow instead of focusing on the more significant concept so that the students can apply in any situation or context. The Maker movement started with Dale Dougherty who is the mastermind behind the Make magazine in 2005; the platform is to give interested parties a place to share their unique projects and ideas with others who are looking to build up their skills and a collaborative learning environment (Hira, Joslyn, & Hynes, 2014).

### **Statement of the Problem**

Makerspace offers students many different forms of opportunities to enhance their learning. The environment provides the resource to connect to a working partner in the community to provide the necessary staff and equipment to train the next generation of the workforce, a mutual partnership that benefits both sides. Corporation gets a pool of talents that

may be interested in working for them in the future; students get a chance to test the culture of the company whether it is a right fit for them, and both benefit from the learning experience.

The need to give students more practical exposure is one of the university top priority to invest resource into the makerspace. Every student has the opportunity to integrate what they learn with real work experience truly, not only they are developing deeper learning experience (Cooke, Forest, Hartmann, Hoover, Hunt, Kohn, Culpepper, & Wilczynski, 2018).

The university invests a considerable resource in making the perfect makerspace for the students, but there is a challenge to find the right combination to have a welcoming feel for the entire community. Cooke, Forest, Hartmann, Hoover, Hunt, Kohn, Culpepper, & Wilczynski (2018) explore different university's makerspace setting what makes it unique and finds room to make an additional improvement.

Many studies were done to find ways to integrate the best makerspace for the university community. An assessment of what motivates students to the makerspace is vital to solve the missing element in the STEM curriculum. Further research needs to find what motivates university students to be engaged in the makerspace and what attracts them to a particular environment. A drive to get more students to spread the news of the makerspace will get more students to be more proactive of their education needs. The makerspace is a solution to solve the practical skills that the corporation is looking for and is currently missing in the recently hired graduate students.

### **Purpose**

The purpose of this ethnographic study is to explore what motivates university students to the university's makerspace, how we can motivate students who did not use the makerspace to give the environment a chance to explore and to experience it, and what adjustments needed to

get more students involved in the makerspace. To further understand what motivates university students to the makerspace. The research will include participants at the public university in an urban setting at two different schools. The participants will consist of any university students whether they have taken a STEM course or not.

### **Research Questions**

1. What is the role of the makerspace on student motivation in a class?
2. How does participation in makerspace affect student's motivation to return?
3. What elements of the makerspace motivates a student to be engaged?

### **Limitation**

From this study, there are some limitations that the researcher comes across are a possibility of bias leading to the data collection if the researcher has an influence leading the interview during the collection period and has to be careful not to inject during the meeting (Creswell, 2015). A misinterpretation of the observed settings by recording on the memo of what the researcher sees but does not give a comprehensive and detailed enough description of the actual occurrence. With this study, the makerspace will have many unfamiliarity equipment and processes that the researcher for the first time is seeing and need time to adjust to make the proper recording or accurate observations — also, the appropriate amount of time required to collect the observation before the participant leaves the environment. Besides, the willingness of the participants answers questions when they are preoccupied with their assignments and projects.

### **Delimitation**

Each university's makerspace is going to be unique with the amount of resource invested in the environment. The setup and operation of this space are going to be different depending on the amount of regular staff, volunteer staff from the community, or student staff mandating the operation. There is a restriction of what projects can take place in the makerspace due to the allocation of space from the university. Resource materials and equipment are continually evolving in preparation for the next class booked for space for a class lecture.

### **Assumptions**

The researcher assumes that participants are willing to spend the time to participate in the interviews and to answer the questions to the best of their abilities. Also, the collected responses kept confidential, and the participants can talk freely without any hesitation. The research will benefit the stakeholders involved to help them review their current operations of the makerspace and to make future adjustments that will invite new people to the makerspace and to provide business justification to increase funding for this project.

## **Chapter II. Literature Review**

### **Introduction**

This literature review will cover the motivation theories and the importance value of having makerspace in higher education. The analysis of different case studies is of makerspace at various universities and what impact it has on the community and the students involved and how to integrate into current lesson plans and the benefits of having it or not. Lastly, research is to find reasons behind the student's motivation to use the makerspace at the university.

### **Motivation Theories**

Park (2017) states that motivation is a pre-requirement of learning; the desire to perform a task or the need of the self to act; an inspiration to learn something new. The traditionalist view of motivation as either reward or punishment, but others see it as a drive or a need (Park, 2017). There are different theories behind motivation; two of them will discuss: expectancy-value theory and self-efficacy theory. The expectancy-value theory is about the relationship of the participants' beliefs that they will exceed at completing the task and is confident of the success (Park, 2017). The higher the success rate, the more motivated the participants to engage, if the rate of success is low, the less likely to engage or act (Park, 2017). Self-efficacy theory is about the participants' beliefs that they are capable of completing the task which motivates them to engage (Park, 2017). High efficacy learners are willing to tackle the more challenging work and the less likely to give up when they hit with a roadblock; they will drive to persist on with the challenge.

### **The Value of Makerspace of Higher Education**

University is continuously adding new resources and programs to serve the students, faculty, and staff better. Makerspace is one of the initiatives that has spread across the campus to support the learning environment. The university is using the engagement of the makerspace as a value for its regional accreditation process; this review process ensures that the accredited university is meeting all standards set forth (Wilczynski, Wigner, Lande, & Jordan, 2017). Makerspace creates an inviting atmosphere of the university to allow the community to share with its growth and to promote for continuous learning improvements and to foster an atmosphere for creativity (Wilczynski et al., 2017).

### **Higher Education Makerspaces Case Studies**

The makerspace of Georgia Institute of Technology is known as the Invention Studio, it was designed originally for the capstone design course, but the expectation spread beyond its initial intention, and now is part of at least 40 different classes (Cooke, Forest, Hartmann, Hoover, Hunt, Kohn, Culpepper, & Wilczynski, 2018). The makerspace is for prototyping and is managed by a volunteer of 100 students to keep the facility up and to run. The university relies on the Invention Studio to prepare students with practical knowledge of the build-out process of a to innovate design as the graduating students prepare to enter the workforce (Cooke et al., 2018). This studio plays a vital part in the student's success and to encourage students to evaluate the actual cost and risk of bringing an idea to be realistic.

Also, the makerspace of Olin College of Engineering is known as The Shop, creates a fantastic environment for mentors and the students to bond beyond the textbook. The Shop includes training on different fabrication equipment and fosters an environment to engage students to design a prototype and to create an actual working piece. It is a co-learning space where mentors are there to guide and to offer assistance, let students try it out first before they

assist them, helps to build student's self-confidence, and to encourage the students to take on risks and to acknowledge their own failures (Cooke et al, 2018). The Weissman Foundry, a local business area, finds the exceptional value of the makerspace, decides to take part of the expansion plans to increase the current makerspace environment, and provides additional resources for both faculty and students. A benefit out of this makerspace is the collaboration to a working partner in the community that helps train and guide the next generation of the workforce.

### **Summary**

The review of the literature offers an understanding behind the motivation theories of learning and why makerspace implemented at the university, and the value makerspace creates for the university. There are many numerous and endless success stories out there about the university involvement with makerspace and the impact it has on the learning community of students, faculty, and staff. Student's participation with the makerspace is part of their requirement for the course, but no comprehensive studies have done of the students' continuous involvement with the makerspace after the sessions finish. Are there characteristics or elements of the makerspace that keep students coming back and interested in tinkering and creating new ideas and what motivates students to the makerspace.



### **Chapter III. Methodology**

#### **Introduction**

The qualitative ethnographic study is to understand the motivation behind the student's involvement with the public university makerspace even after the course has done. This study is done to justify for the university to continue supporting the makerspace project and why it is important to note the effects of the makerspace that creates beyond the course requirement and to provide the university with evidence that its investment in makerspace is worthwhile. This ethnographic study will include questionnaires to makerspace's participants and staff, one on one interviews, small focus groups, observation of the student's engaging with the makerspace equipment and resources, and discussion about ongoing workpiece or past work (Creswell, 2015).

The observation will occur at two public university makerspace with an urban community setting in New Jersey, will cover six months to account for one semester. There is no limitation to the age group participation except that the minimum age is 18 years since power and electrical equipment used in the makerspace environment. The research site is at Montclair State University MIX Lab and Rutgers University Makerspace– Livingston Campus.

#### **Research Design**

This study will be qualitative research through ethnographic design. "Ethnographic designs are qualitative research procedures for describing, analyzing, and interpreting a culture-sharing group's shared patterns of behavior, beliefs, and language that develop over time" (Creswell, 2014, p.466). "An ethnographer spends a large amount of time in the field

interviewing, observing, and gathering documents about the group to understand their culture-sharing behaviors, beliefs, and language" (Creswell, 2015, p.466).

For this study, a realist ethnographic research approach allows the researcher to gain an understanding of what is the motivation behind the students to come back to the university makerspace in a natural setting. The researcher will spend a considerable amount of time at the participant's site and to build a rapport with the group (Creswell, 2015, p. 481). Also, the researcher is going to analyze the data to develop themes about the group (Creswell, 2015, p. 481).

### **Population & Sample**

The population will come from Montclair State University MIX Lab and Rutgers University Makerspace on Livingston Campus. The population will include participants using the makerspace for a course or not. The age group must be a minimum of 18 years since the power equipment used in the environment. "For an ethnography, Morse (1994) suggested approximately 30 – 50 participants and these are recommended numbers for researchers to consider, but the actual number of participants depends on the saturation point" ("Qualitative Sample Size,"2018).

### **Researcher's Position**

The researcher will have no prior interaction with the participants, except the staff to arrange for a time to come to the site to make the observations. The researcher will come to the site location before the observation to get familiar with the campus. Bias may occur if the researcher decides to show an interest in the participant's project. "As a researcher, remain in the background in the written report, to keep bias out" (Creswell, 2015, p.481).

## Procedures

The following steps are taken to conduct the study: First, "identify the appropriate design and how it relates to the research problem," (Creswell, 2015, p. 481) for this will be the realist ethnographic study. Second, "obtain appropriate approval and gain access to the study sites" (Creswell, 2015, p. 481) including IRB permission from NJCU and obtaining site permission from Montclair State University and Rutgers University. Third, "identify a gatekeeper to provide access to the site and guarantee provisions for respecting the site" (Creswell, 2015, p. 481). Fourth, "spending time at the site to collect the data by observing and recording field notes including personal interview, minimum 5 minutes with open-ended questions, focal groups between 3 to 4 people, and surveys through Monkey Survey 10 open-ended questions" (Creswell, 2015, p. 481). Fifth, "analyze the data to establish and to develop theme among the collected information," (Creswell, 2015, p. 481). Sixth, "report on the study through a written report, when writing the report keeping the researcher in the background to avoid bias" (Creswell, 2015, p. 481).

A sample checklist uses to look for during the observation.

1. Staff level involvement
2. The condition of the working environment
3. Is the equipment fully functional?
4. Participants – working in groups or alone, how many?
5. Teacher's role and involvement
6. Are there any written instructions?
7. Observation of the emotion of the participants (facial expressions)

### References

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