WHAT IS NEXT WITH MAKERSPACE PROFESSIONAL INVESTIGATIONOF FRIENDLY FEATURES FOR A VIRTUAL MAKERSPACE?

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Abstract- Makerspace technology have the possibility to reform the way we approach teaching and learning outcome, we want to investigate for a virtual makerspace that support students and their instructors so they can communicate and share material and knowledge to produce their course projects and achieve their learning outcomes. In this paper we reviewed the literature on the use of virtual makerspace at universities and to explore their application in developed countries, and we asked Effat university student for a friendly feature to a suitable virtual Makerspace that they will use for their projects. To investigate for most preferred makerspace platform students like to use, to communicate in and features student prefers in a virtual makerspace.

Keywords- Makerspace,Virtual Makerspace , Professional Investigation, Teaching, Education technology

I. INTRODUCTION

Makerspaces are slowly gaining popularity at schools, colleges, and universities across the globe, thereby substantially improving learning experiences of students by providing them with an opportunity to develop their creative capacities and building skills in a hands-on environment (Fourie, I & Meyer 2015 Smay& Walker 2015). The aim of this paper is to review the current literature on the use of makerspaces as learning hubs in academia and to explore their application in developed countries, and to investigate the friendly features for a virtual Makerspace that the student prefer.

Literature Review

A makerspace or a hackerspace is a physical or virtual location that allows people to gather, work collaboratively on projects, share information and resources (Savage 2013). Makerspaces have been inspired by the hacker culture that is associated with self-directed unscheduled gatherings of like-minded individuals for technological experimentation, idea development, and prototyping (Sheridan et al. 2014). Therefore, makerspaces are often associated with computer science and STEM fields. However, despite its acceptance by tech-oriented students and professionals, the concept of learning through unstructured hands-on approach has grown in popularity among self-directed learners outside academic communities. The last decade witnessed the creation of not only cross-disciplinary zones of inquiry-based learning but also a wide-range
application of makerspaces in art, music, and cooking projects (Sheridan et al. 2014).

The maker movement has been embraced by students around the world. Virtual spaces and libraries have become the location of choice for the majority of students wanting to learn the twenty-first-century skills (Loertscher 2015). There is no surprise that libraries, which hold a unique position in academia, are capable of providing learners with shared spaces "that foster making and active learning" (Purpur et al. 2016, p. 132). By giving students easy access to a wide range of resources and technology such as 3D printing and electronic instruments, libraries foster the creation of learning environments that are far superior to those created by other means.

Despite grooving popularity of the maker movement the number of libraries in the U.S. providing students with maker learning spaces is still extremely limited. However, if the current trend continues and attitude toward the new method of education changes even further libraries with makerspace facilities will soon become a commonplace occurrence. If this is to happen, "libraries at the school, public, and academic level" (Moorefield-Lang 2015, p. 107) have to engage in the creation of a vibrant atmosphere for learning that comes with patron training and resource allocation.

A recent article written by Oliver (2016) reveals that makerspaces preferred by students are categorized according to the specialty areas they represent. The most common activities conducted in makerspace locations across the world fall in the following groups: circuitry and electricity, textiles and soft circuits, robotics and mechanics, rockets and flight, carpentry and architecture, construction and deconstruction, programming, and 3d printing (Oliver 2016). The basic understanding of 3D digital models can be gained with the help of makerspace applications such as Meshmixer or 123D Design (Saorin et al. 2017). SnapCircuits and LittleBits are physical platforms that provide students with instruments necessary for building FM and AM radios, doorbells, and voice recorders among others (Oliver 2016). Software developed by companies such as Arduino, Scratch and Raspberry Pi challenges learners with basic engineering and programming tasks necessary for the creation of mini robots and computers (Oliver 2016). 3D modeling software is another instrument that is being used by students interested in a fabrication domain of the maker movement. The University of La Laguna helps its students to acquire 3D generation and visualization

skills with the help of the game Blokify (Saorin et al. 2017). Lego Designer, Leocad, and Tinkerplay are the names of other platforms that allow the construction of new 3D models using pre-designed units (Saorin et al. 2017). The oldest makerspace for individuals interested in programming and computer science is called Crashspace. Launched in 2010, the program allows like-minded people to share equipment, knowledge, and experience (Horvath & Cameron 2015). It has been already called an incubator of innovation for its groundbreaking projects such as "the Kickstarter-launched 3D printer company" and "LED-laden wearables" (Horvath & Cameron 2015, p. 60).

It should be mentioned that even though professional development activities can be categorized in narrowly-defined specialty areas, "no two makerspaces are alike and should not be" (Oliver 2016, p. 161). Every student can find a platform that is best suited to their knowledge levels, skills, learning styles and preferences. Moreover, modern makerspaces dissolve disciplinary boundaries creating multidisciplinary projects that combine a wide range of activities. Interdisciplinary features of maker learning spaces along with their non-linear structure is what makes them perfect for the inclusion in the pedagogical process. By providing students with an ability to solve real life problems in process driven and collaborative manner teachers can "engage students both academically and intellectually" (Becker, O'Connel&Wuitschik 2016).

The popularity of the maker movement is associated with the act of creating actual physical models that are essential in the design process. The building is beneficial from both academic and economic standpoints: it allows to reinforce creative thinking and eliminate sunk costs caused by the development of flawed models. The focus on building and prototyping in makerspace locations has allowedoverhauling a learning process at the University of Puerto Rico, Pennsylvania State University, and the University of Washington (Barrett 2015, p. 3). The curricula in these universities have been changed in order to place more emphasis on design and manufacturing which are core activities of the Learning Factory model (Barrett 2015, p. 3). The model allows students to spend more time in makerspaces, thereby significantly improving their cognitive functions and strengthening their understanding of the material covered in classrooms. Physical representations of real life concepts help young learners to "find new design requirements and design features" (Barrett 2015, p. 3).

The maker movement has pushed forward the acceptance of multiuser virtual environments (MUVEs) and their use for learning (Wang & Burton 2012). MUVEs allow their users to seamlessly interact with each other in virtual environments via complex graphical representations. Indiana University has spent millions of dollars in order to develop Quest Atlantis—a virtual environment for learning. North Carolina State University and Harvard University have followed suit and created their own MUVEs—WolfDen and River City (Wang & Burton 2012). Active Worlds, Second Life (SL), and AppEdTech Zone are the most popular platforms used by students interested in learning facilitated through an open-end virtual world (Wang & Burton2012). The phenomenal growth of MUVEs popularity has pushed for the use of Second Life by teachers to supplement their classes. Students prefer using the platform as a communication medium. Educators, on the other hand, prefer exploring it for "delivering lectures,making presentations, and conducting discussions" (Wang & Burton 2012, p. 3). The technology has made possible teaching entire courses in the computer-mediated virtual environment of SL (Wang & Burton 2012). Unlike conventional makerspaces and learning environments, SL allows its users to navigate media content, browse documents in virtual libraries such as Second Life Medical, and develop social skills. In addition to featuring text chat, SL also provides students with a realistic voice chat. The rich potential of such environment to create engaging learning experiences has been explored by the company called Moodle that has created course management system Sloodle that makes it possible to conduct virtual world conferences and lectures (Wang & Burton 2012).

The first public library that expanded its services to provide accommodation of makerspaces for the by local communities was Fayetteville Free Library (FFL) or FabLab that is located in New York (Slatter& Howard 2013). The recognition of the significance of fostering collaboration and creation has led to the spread of FabLabs across the globe. A study exploring the use of maker locations in Australian public libraries suggests that even though physical representations of makerspace facilities might significantly differ they all are centered around similar goals Slatter& Howard 2013). The common objectives of makerspaces include: to expand library services, promote community engagement, facilitate "equitable access to tools such as 3D printers, that would otherwise be off-limits" and "to transform traditional understanding of libraries as places of consumption to places of creation" (Slatter& Howard 2013, p. 273).

The makerspace movement is also on the rise in China (Savage 2013). The first shared studio for exchanging knowledge, software, and hardware was opened in Shanghai in 2010 (Lindtner& Li 2012). According to a study exploring Chinese hackerspaces, "as of April 2012, there are more than 500 active hackerspaces" (Lindtner& Li 2012, p. 19) in China. Another regional study dedicated to the growth of makerspaces in Asia shows that the creation of the first hackerspace in Tokyo was inspired by similar initiatives in Singapore and India

(Kerra 2012). Kerra (2012) argues that "hackerspaces appear to be gaining momentum in Southeast Asia" with the most recent opening of makerspace facilities in Bandung, Surabaya, Yogyakarta, and Medan (p. 7). The growth in popularity of the maker movement became possible due to the existence of a significant number of Fablabs and other small-scale workshops in the region. While the makerspace locations in Asia are similar in their structure and functioning to those in the U.S., many of new facilities have been inspired by the EU hackerspaces such as HONF (Kerra 2012). Following the example of Hungary and France, the Asian makerspaces organize workshops for local artists and academics in order to solve problems of their communities.

II. METHODOLOGY

For this study a survey was used to know what are the virtual-makerspace features that the students prefer, what is the platform that they want to work on for university courses at Effat University Jeddah.

III. SAMPLE

A sample of Effat university student was selected from different levels and majors (College of Engineering - Colleage of Science and Humanities-College of Business-College of Architecture and Design).

IV. DATA COLLECTION

The survey was emailed to (100) students and (100) response was submitted and accepted.

V. THE SURVEY QUESTIONS

A Few Questions was written in the survey to focus on the makerspace general friendly features that will be convenient for all majors, the survey was build and distributed by using google forms by the e-mail:

1. In which form do you prefer the information delivered to you?

- Text
- Audio
- Video

2. Where do you want to create your course projects?

- In the university lab during the lab hours only with your instructor and mates
- Virtual Makerspace that you can share with your instructor and classmates any time
- Other

3. In the virtual Makerspace do you like to find links for websites that you can buy the project material and equipment?

- Yes
- No

4. Do you like the virtual Makerspace to be an open source or require creating an account?

- Open source
- Makerspace with accounts

5. In which platform you like to communicate with your classmates and instructors?

- Whatsup
- Facebook
- Tiwter
- Google+
- Linkedin
- Email
- Other

6. Do you think a virtual Makerspace need more features that will help you create your project if yes please explain?

Your answer: _____

VI. DATA ANALYSIS

The Data was analyzed by using google forms analysis. The google forms analysis provides a response by a question and a report and Excel sheet was created.

RESULTS

The survey response was Effat University student (100) from all levels and majors (College of Engineering - Colleage of Science and Humanities-College of Business-College of Architecture and Design) from the age 18 to 25, each student did the survey and the survey shows that (82%) prefer the information delivered by videos and the other choses audio and text in the makerspase as shown in the figure1.

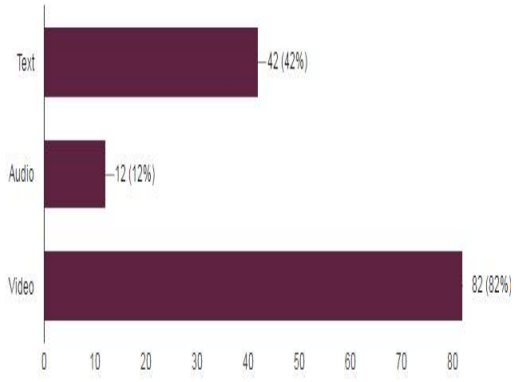


Figure 1

(53%)want to create their project in a virtual makerspace, (79%)of the student want to find links in the makerspace that provide the project material and equipment, (65%) want the makerspace to be an open source, (68%) of the student like to communicate with their instructor and classmates throw Whats up, the other choices email and other social media applications like Tiwter or Google+ as shown in figure 2.

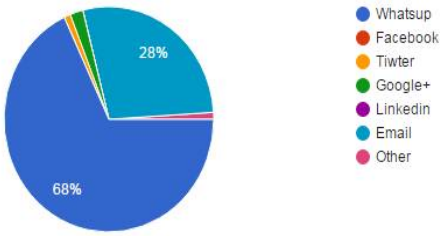


Figure 2

Some of the student added some features that they think the makerspace will need like connecting with expert in their field.

DISCUSSION

The survey in this investigation is to determine the friendly features for a virtual Makerspace , from the survey (53%) of the student want virtual Makerspace to create their project in , and through our teaching experience and the survey outcomes the material and the information must be delivered by the three ways (Text-Audio-Video) to face the different learning styles ,in an open source website as (65%) student desire .(79%) student prefer a makerspace with links that can provide the project material and equipment .A virtual makerspace with the support of Whats up application so the student can communicate with their instructor and mattes that (68%)student prefer .some student indicate that a makerspace need to be connected to an expert in their field so (he/she) can offer help to the student as needed.

CONCLUSION AND FUTURE RESEARCH

We think that a makerspace with this features will get the instructor and the student to achieve their goals and course outcomes in regular classes with a support for distant learning to .So in the future we will create a template that the instructor will use to build their own virtual makerspace that is suitable for their projects to meet the student needs and the project requirement . and this will get us to a unique and expellant outcome .

At the end we must prepare ourselves and our students to adjust the new technology that can enhance our life to achieve our goals

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