Project 3: Leadership Vision and e-Learning Plan

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Introduction

Makerspaces have increasingly become a popular way to promote student engagement in STEM-(Science, Technology, Engineering, and Mathematics) and STEAM (Science, Technology, Engineering, Art, Mathematics)-related activities. Makerspaces are also one answer to the need to prepare American youth for the significant increase in STEM jobs expected between the years 2010 and 2020 (U.S. Department of Education, n.d.). Currently, few American students seek training and degrees in STEM fields. Makerspaces often make use of technology, but they could be infused with technology further to assist and enhance students and their learning, rather than just provide experiential and hands-on learning opportunities.

Vision

The 21st century has provided many excellent technologies being incorporated in the classroom today. From computers and laptops to tablets, SmartBoards, document cameras, student/classroom response systems, Google Cardboard and Expeditions, and more, education is integrating more and more of these technologies every year. With the release of the NMC/CoSN Horizon Report each year, institutions of both K-12 and higher education are provided with a glimpse of what is trending and worth incorporating. This regular report will hopefully continue to offer information each year with the availability of new technologies, trends, and developments.

One trend in educational technology that has taken off commercially, in higher education, and K-12, is known as the Maker Movement, which encompasses Maker Education and Makerspaces. Makerspaces are places where people with shared interests come together to create and tinker while also collaborating and sharing ideas and knowledge (Adams Becker, Freeman, Giesinger Hall, Cummins, & Yanked, 2016). Kurtis, Kurti, and Fleming (2014)

suggest that Makerspaces, particularly Educational Makerspaces, can "revolutionize the way we approach teaching and learning" (p. 8). Makerspaces are founded on hands-on learning through the building of things, which is known as Seymour Papert's constructionism. These spaces lend themselves to active and inquiry-based learning and provide many opportunities for people to engage with and learn 21st Century Skills like creation, collaboration, problem-solving (Partnership for 21st Century Learning, n.d.).

Because collaboration and sharing are key aspects of the Maker Movement, with Makers forming a culture and community, this trend in educational technology can be considered a Community of Practice (CoP). According to Lave and Wenger (1991), a CoP is a group of people who have a common interest, craft, or profession, and engage in a practice of mutual learning in a shared domain of human effort. Often in commercial Makerspaces, a CoP exists. Maker-related CoPs also find a place on the Internet with websites like Makerspace.com, Baqqer.com, Kollabora.com, which are online communities for Makers to socialize and share DIY projects.

Makers are collaborating in an online forum, but this opportunity was created as more of a commercial endeavor. Makers can share ideas, create and watch videos developed by other Makers, and socialize. In essence, e-learning is taking place online informally. As defined by Clark and Mayer (2016), e-learning is "instruction delivered on a digital device that is intended to support learning" (p. 7). Because of a deep passion for Making, people want to learn how to do or create something and can find almost any information they want with the help of the Internet. They can learn from others and take what they've learned to practice.

While informal e-learning is taking place amongst Makers from all over the world in a general forum, what is happening in Makerspaces in both K-12 and institutions of higher

education? Schools with Makerspaces could benefit from having their own forum, geared specifically toward their own individualized Makerspaces. K-12 teachers and college professors could make use of e-learning geared towards the school's Makerspace and make it available to students in their courses who actively or are required to use the Makerspace. An e-learning environment would be an excellent addition to a traditional, physical Makerspace.

Blended learning is a specific model of e-learning that would work especially well with a traditional Makerspace and provide benefits to students. Blended learning is another trend outlined by the NMC/CoSN Horizon Report in recent years for both K-12 and higher education. Horn and Staker (2014) define blended learning as "any formal education program in which a student learns at least in part through online learning, with some element of student control over time, place, path, and/or pace" (p. 34). Blended learning allows students to access personalized learning tailored to their individual needs, and competency-based learning that shows students have demonstrated mastery of a certain skill or topic before moving on (Horn & Staker, 2014). Makerspaces allow for student-centered learning, where they take control of their own knowledge acquisition, and blended learning allows for the same, making Makerspaces in a blended learning environment a good match.

Blended learning uses four main models, one of which is called a *Rotation Model*. Horn and Staker (2014) remark that this model "includes any course or subject in which students rotate—either on a fixed schedule or at the teacher's discretion—among learning modalities, at least one of which is online learning" (pp. 37-38). The Rotation Model has four subcategories with the best fit to apply to a Makerspace being the *Flipped Classroom*. Horn and Staker (2014) define a flipped classroom as a situation in which, "students consume online lessons or lectures independently, whether at home or during a homework period on campus" (pp.42-43). For the

application to a Makerspace, class time can be spent putting what is learned to use, allowing the teacher or professor to provide assistance and support.

As the Director of Technology at Tesla Tech College in Shoreham, NY, my vision is to have all courses and students who use the college's three Makerspaces engage in a required blended learning environment specifically created for our school's Makerspaces. Students taking courses who use the Makerspaces will be able to do training, participate in discussions, complete and submit assignments, watch and create how-to videos, sign up as experts to provide help to others both online and in-person, contribute to shared resources for any Makerspace users to access, and provide advice and assistance to other Makers. Students not enrolled in courses who want to access the Makerspaces for hobbies will also be required to be a part of the e-learning community. Involving students not enrolled in Maker courses will contribute to the CoP and help unite all three Makerspaces. Tesla Tech College currently uses Blackboard as our Learning Management System (LMS), but it has not yet been thought to have our Makerspace managers make use of the LMS for blended learning purposes. If successful, this implementation could be shared with other institutions of higher education with Makerspaces, as well as K-12 schools.

Using a blended learning environment for our Makerspaces and related courses will be a great benefit to students. Horn and Staker (2014) have identified that studies show the benefits of personalized learning, which is enabled within blended learning. Blended learning will enhance the existing learning structures of the Makerspaces and allow for a Tesla Tech College Maker community to continue to learn and grow outside of the physical space.

E-Learning Plan

To make my vision a reality, I will need to follow several steps before incorporating blended learning into the Makerspaces can be implemented. Following the practice of

instructional design and making use of the ADDIE model, it is recommended first to analyze which can be done by conducting a needs assessment. Performing a needs assessment helps answer and understand the following questions according to Brown and Green (2015):

- What problem exists or what change is being requested?
- Who is being asked to change?
- What is currently taking place with the individual or individuals being asked to change?
- Who identified the problem or is requesting this change?
- Where will the solution or change need to take place?
- Is instruction the most appropriate means for solving the problem or bringing about the desired change?
- What is the solution to be developed and implemented? (p. 56)

Once information from the needs analysis is collected, the next three steps of the ADDIE model, Design, Development, and Implementation, can be conducted.

The specific change being requested is to create an e-learning blended environment for the Makerspaces and courses associated with it. This change will help create a CoP that can exist at all times when in and out of the physical Makerspaces, and also provide a place of support and shared resources. Currently, an online shared environment doesn't exist for the Makerspaces but is used by many of the professors to manage online classes, or just provide a place for students to access grades and feedback from traditional courses. The college is using Blackboard as its LMS, and all professors must use it in some form. Professors are required to at least use Blackboard for grading purposes.

This change will affect the Makerspace managers who are trained teaching assistants (TAs) who run the Makerspaces, professors who teach courses that use the Makerspaces,

students in these courses, and students who use the Makerspace for hobby work but do not take courses that make use of the spaces. Currently, professors simply send their students to the Makerspaces to complete projects for engineering, computer science, architecture, art, and other courses. Students work in the Makerspaces but don't necessarily know each other, and certainly not if they are always attending one of the three Makerspaces on campus. Naturally, Makers will help each other and provide advice in the Makerspaces. The TA on duty can also provide assistance. The professors will sometimes visit the Makerspaces and provide an office hour during projects. Students not affiliated with courses that use the Makerspaces are welcome to visit and use the locations to complete and work on personal interests or hobbies. As it is now, what happens in the Makerspaces stays in the Makerspaces. Nothing related to Making is happening beyond those walls, except for within the courses that use the Makerspaces. To develop the Makerspace and Maker Culture further, implementing a blended learning design will be helpful.

Some instruction will be necessary to make this implementation work. All students and professors are familiar with Blackboard because they must use it to some degree. Professors must at least post grades and students will be familiar with that aspect. The TAs are students, as well, and are familiar with Blackboard. To have professors and students become more familiar with the other functions of Blackboard that can allow for blended learning to take place, additional training will be offered. Training will be provided through How-To videos, How-To PDFs, and in-person training. Additional instruction and professional development on blended learning activities will also need to be provided to give the professors and the Makerspace managers the skills they need to create high-quality experiences for learning and collaboration.

In order to have this plan be successful, as the Director of Technology, I will need to bring forth a transformational leadership style. The Makerspaces, Tesla Tech College's Maker Culture, students, and professors can all benefit from the addition of blended learning, and to get everyone onboard, I will need to engage with others, create connections, and raise the level of motivation (Northouse, 2013). This particular type of leader is known to create a vision, be effective at working with people, empower followers, nurture them in and through the change to take place, and listen to them (Northouse, 2013). People are often hesitant when it comes to change and might think that the Makerspaces works fine as they are, but this addition to the Makerspaces would be something worth embracing.

In my position as Director of Technology, one of my tasks is making decisions regarding existing and new technology. For any decisions to be approved, I must share my proposal with the school dean. Before meeting with the dean, I'd like to hear from students, TAs, faculty, and school officials what they think of the blended learning concept and how it might fit into our Maker culture. To do so, I would need to put together a committee to review the current state of affairs with the Makerspace and the learning taking place, and they will have an opportunity to provide feedback about where they envision things going. Information like this will be helpful in further developing my vision and e-learning plan.

Organizationally, the most challenging aspect of implementing this blended learning addition to the Makerspaces and affiliated courses is making sure the involved stakeholders are trained and have opportunities to receive additional training, ask questions, and receive support as needed. Initial training might require the hiring of a consultant to teach blended learning. After those initial training sessions, identifying professors or TAs who feel as though they could teach and help others could be helpful to maintain assistance for blended learning as time goes

on. Professors and TAs who offer to mentor and coach others could receive additional stipends. Additional training for Blackboard will likely also be required, but that can be provided by myself and other professors who are proficient at using Blackboard to its highest capabilities. Professors that offer to coach or mentor others in Blackboard will also receive stipends. The Makerspace managers will have the most involved part of this process, as they will be managing the shared resources. They will need to create and curate an online location that houses resources developed by Makerspace managers, professors, and students specifically for the Tesla Tech College Makerspace. Because being a TA is a voluntary, stipended job, updating the job description to include the requirements related to the blended learning environment will be necessary.

A final aspect to consider when developing this e-learning plan is that an ample amount of time will be needed for professors and TAs to create online content. A discussion with department chairs and the dean will need to include a plan of how to allow for faculty and staff to find time to do the work associated with the development of a blended learning environment for the application to the Makerspaces.

Funding Proposal

The implementation of a blended learning environment to the existing Makerspace will be a very valuable addition. Not only will this e-learning model be useful for the Makerspace itself, but it will also be used for all courses that make use of the Makerspace. Additionally, students who use the Makerspace for hobbies will become included in the CoP that is created online as a result of the blended learning implementation. No longer will they be loners in and out of the Makerspace, these hobbyists will have a place to connect, share, and collaborate online specifically about the Tesla Tech College's Makerspace.

From an economic standpoint, the implementation of this e-learning model will only have a high initial cost when hiring and using a consultant to provide blended learning workshops and training. Having a consultant on campus could be close to $3000 for a week. After the initial training, we might need to have available support through the consultancy until professors, and TAs get on their feet with making blended learning available to students. Students will need time to learn about Blackboard and blended learning if they have not yet encountered it and will be invited to attend workshop sessions if they choose. Blackboard and blended learning training done by in-house experts (e.g., professors and TAs) will require stipends, which will be another expense that will likely continue for several semesters, and must always be available to new faculty and Makerspace staff. Conveniently, we will make use of the already in use LMS, Blackboard, so that no additional costs will occur regarding this specific type of technology.

Blended learning with the Makerspace has the potential to increase success amongst student learners, create an opportunity for more collaboration, and even simplify Makerspace tasks. Some Makerspace training could be done through Blackboard with video lessons and tests in the form of competency-based learning. Training is required for all students who use the Makerspace. Online training could save time and allow many students to go through training at the same time. There is still a part of the training that must be done in the physical Makerspace, but students could use the flipped classroom model to prepare in advance, then practice, and show their competency in the Makerspace.

The addition of e-learning to the Makerspace can also put Tesla Tech College on the map. If this implementation is successful, we might be able to present at future educational technology conferences and share our ideas with other institutions of higher education and even K-12. The results of students using and contributing to the blended learning environment could

lead to having a prominent website showcasing what is done in our Makerspace. The list of resources and how-to videos contributed by students, professors, and TAs will be useful to all who use the Makerspace and could eventually be part of what is showcased on a future website.

In order to fund my vision, the college will likely need to institute a small tuition increase. Because we are a small, private institution of about 8,000 undergraduate and postgraduate students in total with a focus on STEM, many of our students take courses that are affiliated with our Makerspace. A small increase in the tuition should not be alarming to students and their families, especially if the college advertises improvements we are making to our Makerspace program and what the benefits to students are.

Conclusion

Implementing blended learning into our existing Makerspace and the affiliated courses should be a beneficial update to our program. All of our professors are currently using our LMS, Blackboard to at least manage grades for students. Students have experience with Blackboard to access grades and feedback and possibly more, as some courses they take are completely online, and some are already a blended model. While blended learning might not make sense for a Makerspace that provides hands-on experiences and learning, blended learning can enhance this.

The final step of the ADDIE model is to evaluate. To assess and measure the success of this vision and e-learning plan, we will collect data both quantitatively and qualitatively after one full year of implementation. A mixed methods study will be conducted that uses surveys, interviews, and focus group meetings with faculty, TAs, and students. Additionally, grades will be collected and compared to previous years. This study will continue over the next few years to see if the change has truly had a positive impact.

Having an online place for collaboration, support, learning, and resources will be an excellent addition to our heavily used Makerspaces. A blended learning environment has the power to provide ways to bring together the Tesla Tech College student Makers in a new way and add to the Maker culture that already exists. Because of the nature of who Makers are, I am hopeful that the students, professors, and TAs alike will embrace this change.

References

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