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INFORMATION SYSTEMS EDUCATION JOURNAL

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Group Assignments as a Class Element to Promote Performance in Virtual Groups

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Abstract

One of the responsibilities of business schools within universities is to prepare students be successful in business. Success in business often requires students to be effective working and collaborating in virtual teams: groups who are geographically dispersed with members who have never met. Schools have become aware of the need for students to work in teams, but need to investigate the structure and design of courseware to build collaboration skills within students. The goal of this research was to determine if there is an optimal number of group assignments that will result in better group learning performance. This research investigates the optimum number of group assignments needed to promote effective work within virtual teams, by examining performance on a final assignment of a business case. The findings are that students who have at least a medium exposure (three) to group assignments performed significantly better on the business case and cost risk benefit analysis then students with no group assignments prior to the business case. This is significant because it can aid in the pedagogical development of undergraduate and graduate courses in information technology.

Keywords: Group performance; group collaboration; virtual groups; self-regulated learning.

1. INTRODUCTION

A group becomes a team when it can produce excellent results. One question we can ask is what class work elements can be used to improve group academic and business performance. As businesses and teams become more global and dispersed or virtual, we need to address the instructional designs in graduate business classes that will facilitate students becoming effective team members and delivering better teamwork products in these settings. Ives and Jarvenpaa (1996) and Gilbert (1996) suggested that online technologies would change business education and instructors, and predicted the widespread deployment of virtual teams in classes, with students becoming more active in their own learning and research. However, Arbaugh et al. (2009) indicated that this transition has not moved as quickly as those authors' predicted**.**

There are reasons linked to this slow adoption. At the university levels, a concern often raised by business school scholars is that research in education has not been perceived as valuable by business and education, and research has not addressed the applicability of education research and pedagogical best practices to business. Educators have had little to guide them when making decisions regarding the elements of comprehensive design of classes. Yet, currently business schools are expected by professional organizations to be involved in learning and

education research and to apply this research to their organizations (Arbaugh et al., 2009).

Although a significant body of research over the past twenty years has indicated hybrid or blended courses can result in more positive student outcomes than face-to-face and purely online courses (Arbaugh & Benbunan-Fich, 2007; Arbaugh et al., 2009; Benbunan-Fich & Arbaugh, 2006; Means et al., 2013; Zhao et al., 2005) it has not investigated the most effective blend of course elements to improve student outcomes. These elements can include face-to-face and online time; the use of technologies; and, a particular concern of this research, the level of student interaction or group work (Zhao et. al., 2005) and group goal setting (Buller & Bell, 1986).

From an operational perspective, learning management systems and web delivery have revolutionized higher education. The proliferation of online educational tools has begun to have a dramatic effect on higher education and corporate education and training. However, there is a need for teams to be able to interact effectively through online collaboration tools to learn as a group. There has been limited research in the area that addresses the effectiveness of learning through online group collaboration to enhance student performance. This research presents the results of a study to assess the level of group experience on the quality of group deliverables.

It would be beneficial for educators and corporations to examine one of those pedagogical elements, level of group assignments, or student interaction, as effect on student performance, as demonstrated by group-based performance on a business case and cost risk benefit analysis. This paper will present a quantitative assessment of level of group performance as a consequence of level of assignments.

2. LITERATURE REVIEW

A review of significant research during the 1990s regarding online/hybrid learning and collaboration offered some general conclusions. The studies showed the delivery of business education using hybrid technology compared significantly better to face-to-face education; asynchronous communication stimulated group communications in online environments; and collaborative team relationships could be developed in online, virtual groups (Arbaugh et al., 2009). These findings bode well for corporate environments that rely more heavily than ever on the performance of disparate, virtual groups.

Work since 2000 work has centered on the development of general frameworks for effective online and blended business education, but there has been very little testing of these frameworks, and virtually no investigation of the structure of class elements such as level of group interactions. Zhao et al. (2005) examined 51 studies and found that a mixed, blended approach, in which 60%–80% of learning was delivered via "technology", had significantly more positive student performance when compared to face-to face instruction and pure distance learning. In an attempt to identify specific operational elements of blended and virtual groups, the authors recommended examining courses elements of time, instructional resources, and interactions among students to determine if levels of these class elements contributed to outcomes. They indicated that experimental research to test designs is needed for empirical evidence to support course design practice. For example, with regard to elements, the appropriate blend for instructor interaction is not always clear. Balotsky and Christensen (2004) examined traditional and information technology mediated education and proposed the need to develop teaching pedagogy that more accurately promotes the development of skills required for student success in the business environment. They argued that since the business environment is a mix of traditional, face-to-face, and distributed IT- mediated alternatives, institutions should offer this mix in their curriculum to address not only student educational options, but also as to reflect workplace demands and enabling technology. As with Zhao et al. (2005), the authors pointed out that pedagogical issues, such as lectures, collaborative assignments, knowledge construction, in-class and out-of-class constructions had not been extensively examined. Walker (2003) found that the instructor's role in hybrid environments moved to one of facilitator to student directed learning, and provided a pathway to virtual work environments. Brower (2003) raised awareness of the risk of level of instructor intervention in online collaborative environments, as a possible impediment to student directed learning.

There is a large body of research regarding students working in virtual teams and how this provides for collaborative activities that serve as an opportunity for learning to better performance in virtual groups. Group collaboration tools within learning management systems such as WebCT, Blackboard and E-College have increased drastically (Kartha, 2006). These tools support group work for both traditional and online classes,

by supplying a virtual collaborative environment. Course management tools provide logistical enablement, but students learn more when they participate in group endeavors through the exercising of cognitive processes that require resolution of conflicts or disagreements in group discussions, assimilation of knowledge, and discussion/negotiation (Benbunan-Fich and Arbaugh, 2006; Benbunan-Fich & Hiltz, 2003; Piccoli, Ahmad, & Ives, 2001; Webb, 1982). In a study of 40 MBA courses Arbaugh and Benbunan-Fich (2007) found that students perceived learning was higher in courses designed with group learning activities, and with instructor-led content (group-based objectivism), when compared to individual oriented courses. Students achieve higher perceptions of learning in courses where knowledge is transmitted through the system, and students are engaged in collaborative assignments. The authors found that the absence of knowledge construction and group collaboration has a negative effect on student performance. The authors also determined that a significant number of studies indicate participant engagement, whether it is between participants and/or between participants and the instructor, is one of the strongest predictors of positive student performance. Arbaugh et al. (2009) reported studies of learner–learner interaction and instructor-leaner interactions both showed positive results in learner outcomes in online courses.

In terms of participant interactions, two meta-analysis of a combined nearly 100 experimental or quasi-experimental studies found that student performance was better in blending learning, when compared to face-to-face instruction, but revealed that an essential mix for class elements of time, resources, and interactions in classes has not been measured. In addition to the afore-mention work of Zhao et al. (2005), Means et al. (2013) analyzed 45 studies to determine that students in blended, online learning out-performed students in face-to-face classes; and purely online classes did not indicate an advantage over face-to-face classes. The authors concluded that research has not adequately investigated the appropriate blend of online and face-to-face delivery approach or the extent of collaborative group learning needed to affect performance.

3. RESEARCH METHODOLOGY

Our research centered upon the following research question: Is there an optimal number of group assignments that will result in better group learning performance? To address this, the results of a business case and cost-benefit/risk analysis were utilized.

The research hypothesis to be tested was as follows:

H_1: There will be no significant difference in student learning, as defined by group performance on a business case and cost risk benefit analysis, between groups with High (H) exposure, Medium exposure (M), and Low exposure (L) to the classroom element of group collaboration/participant interaction. High exposure is defined as six group collaboration assignments prior to the business case and cost risk benefit analysis; Medium exposure is defined by group collaboration on three assignments. Low exposure was the groups with no exposure to group collaboration on assignments.

Participants

One hundred and twenty eight (128) full-time MBA students enrolled in an Information Systems strategy course in a major university in the northeastern United States in four courses from the Fall 2015 semester through Fall 2016 participated in this study. The students were all 'fifth-year' MBA students with limited work experience. The students were similar in age with an average age of 22. The course was offered in a traditional, face-to-face, 16-week semester. Most of the students had an undergraduate degree in business. Each student in the course had access to the group collaboration tools in Blackboard, and was required to use this tool for assignments and collaboration. The same instructor taught all of the sections of this course and utilized the same case for analysis.

Design

Students were randomly placed in one of three group types to be exposed to the level of group collaboration/participant interaction learning. For the most part students were placed in groups of three, although one groups had two members, due to one student dropping the course. Group collaboration/participant interaction is operationally defined as the number of online group assignments. There were six assignments in this class. Two of these assignments concern a fictitious company, in which an information systems group fails to establish a business case for an e-commerce implementation.

In the experimental groups, students worked in teams of three on assignments. In the High (H) groups, students collaborated on all six assignments, and submitted each assignment as a group. Groups with a Medium (M) blend

collaborated on three assignments, and submitted three assignments as a group and three of the assignments individually. In the control or L group, students worked alone on the assignments. There were 43 groups in this study: 14 each of H and M groups, and 15 L groups.

The dependent variable in this study was performance on the design of the business case and cost risk benefit analysis. This course is entitled Information Systems Strategy, and is the study of business analysis and information systems. A major theme of this course is establishing a return on investment for information systems projects, as a quantitative business justification for any information systems project. The return on investment is operationalized through a Business Case analysis and cost risk benefit analysis. For the final requirement in the class, the students need to establish a justification for the failed e-commerce implementation that they studied from the beginning of the course.

For this final requirement, all students worked in groups and submitted their results as a group, including students in the L groups. The total Business Case/ Cost Risk Benefit score for each group was based on the combined scores of these two submissions. The business case was evaluated based on a rubric developed from Components of a Business Case from Pearlson and Saunders (2013). (See Appendix A: Rubric for Business Case). For this scale, groups can score a maximum of 50 points, based on 0-5 points for 10 business case elements, with the scale based on higher scores for quantitative return on investment formulas and measurable and observable factors in various components of the business case. These ten components are Executive Summary, Assumptions and Rationale, Program Summary, Financial Discussion and Analysis, Benefits and Business Impacts, Schedule and Milestones, Risk and Contingency, Conclusions and Recommendations, and Appendices. Two raters evaluated these categories, and the score for this component for each group was the average of their rating. The rater inter-rater reliability on these scores was 77.5%.

The Cost Risk Benefit submission was evaluated based on a rubric developed from Pearlson and Saunders (2013) (See Appendix B: Rubric for Cost Risk Benefit Analysis). This scale was open-ended, in that students supplied cost, risks, and benefits based on "Doing New Things", "Doing Things Better", and "Stop Doing Things". The rating scale was the same as was used for the Business Case. Two raters evaluated these categories independently, and the score for this component for each group was the average of their rating. The rater inter-rater reliability on these scores was 80.0, using the simple percent agreement calculation. Cohen's Kappa coefficient was also calculated and the result was 0.77. Cohen's Kappa is a generally more accurate measure as it takes into account agreement that is the result of random chance (Cohen, 1960).

4. RESULTS

The result of the research indicated that there was a significant difference in the student performance on the Business Case and Cost Risk Benefit Analysis. The source of this variability was between the High and Low groups and Medium and Low groups in the assignments, with the High and Medium Groups scoring significantly better than the Low Groups.

Table 1 shows the average scores for the students for the High, Medium, and Low Groups on the dependent variable. Each of the students in every group received the same score as the group the for the Business Case and Cost Risk Benefit analysis.

Table 1. Performance on Business Case/Cost Risk Benefit Analysis

Level of Assignment	N =	Mean Score for Total of Business Case/Cost Benefit/Risk Analysis
High	41	77.4878
Medium	42	73.5000
Low	45	65.5333

Table 2 shows analysis of the student performance on the business case and cost risk benefit analysis. The overall F value shows significance for the Total Business Case/ Cost Risk Benefit Analysis ($F=7.61$, $p < .01$) across the population.

Table 2. ANOVA for Total Business Case/ Cost Risk Benefit Analysis Score

Source	DF	SS	MS	F	Pr > F
Model	3	4075.01	1358.34	7.61	0.0001
Error	124	22131.41	178.48		
Corrected Total	127	26206.42			

Since the F test indicated an overall effect of the only dependent variable, paired-comparison t-tests were utilized to find the source of this variability between groups. Tables 3 and 4 shows the t-Test analysis on two of the three levels of groups in the business case and cost risk benefits. There was significant difference in the Total Business Score between the Blended Groups between the High (M = 77.49) and the Low Group (M= 65.53), ($t = 4.31$, $p > .01$), and between the Medium (M=73.50) and the Low Group, (M=65.53) ($t = 2.71$, $p > .01$). There was not a significant difference between the High and Medium Groups.

Table 3. T-Test for Total Business Case/ Cost Risk Benefit Analysis Score: High vs Low Groups

Group	N	Mean	SD	t Value	Pr > t
High	41	77.49	13.29	4.31	.0001
Low	45	65.53	7.25		

Table 4. T-Test for Total Business Case/ Cost Risk Benefit Analysis Score: Medium vs Low Groups

Group	N	Mean	SD	t Value	Pr > t
Medium	42	73.50	14.93	2.71	.0008
Low	45	65.53	12.42		

5. CONCLUSIONS

Studies designed to assess course outcomes as a consequence and mix of process and elements of the course experience are emerging (Kim et al., 2015: Kock et al., 2007; Lapsley et al., 2008). As blended learning becomes more widespread, best practice around blends by discipline will require quantification by elements (Allen, Seaman, & Garrett, 2007; Proserpio & Gioia, 2007; Webb & Poe, 2005). Researchers have called for the design of studies of effectiveness of frameworks for business education and business schools. (Arbaugh, 2008a; Arbaugh, 2008b; Arbaugh et. al, 2009; Arbaugh, 2014); Heckman & Annabi, 2005, McDonald, 2011).

The purpose of this research was to assess the impact of group collaboration, by using an experimental design, with an objective, not "perceived", scale. These results are encouraging in addressing the pedagogy concerning the quantification of the mix of activities that best promotes student learning; in this case, the number or amount of collaborative group assignments that will affect the subsequent group performance on a critical learning task. These results indicate that the groups who had at least three group assignments scored significantly higher on the Total Business Case and Cost Risk Benefit Analysis than groups who had no collaboration experience with each other. Though group learning has long been used within MBA programs, this provides quantitative support to validate the effective level of implementation to achieve team growth. Teams that had six group assignments did not perform significantly better than the groups that had three assignments, but did perform better than groups with no collaboration experience. This data suggests that the number of assignment collaborations needed to enhance group performance is three, but is inconclusive in terms of whether more assignments (in this case, six) results in significantly better performance. This, of course, requires further examination. This study is significant in that the test subjects came from a variety of undergraduate disciplines. Within each business discipline, utilizing group collaboration tools online has become increasingly important. This provide empirical support for educators when designing their courses.

Cook & Campbell as reported by Edmonds & Kennedy (2013) describe three conditions that must be present to establish cause and effect. They include: (1) covariation (the change in the cause must be related to the effect), (2) temporal precedence (the timing of the effect must be subsequent to the cause), and (3) no plausible alternative explanations. The results of this investigation meet these three conditions.

There are a number of limitations in this research. This research was done with a hybrid class, which is primarily face-to-face. Studies in the future should address other blends of classes, particularly online. This preliminary effort to quantify the optimum blend of group collaboration exercises to promote learning in virtual groups, could ultimately affect the design of future hybrid or blended courses.

6. FUTURE WORK

We will extend the research to perform the same study with students who are taking the course in an online environment, to take advantage of and study students on virtual teams, and to determine if significant differences exist based upon the delivery method of the course. Since online learning environments are equivalent in terms of

logistics and the remote nature of interaction with virtual teams in business, studies with online classes should be insightful in determining effective working environments and team achievement to be utilized in course design to train future business virtual team members. These subsequent studies can provide an opportunity to better investigate and quantify the optimum blend of group collaboration to promote learning in virtual groups. In addition, we intend to explore other variables that influence group performance within information systems graduate education.

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Appendix A. Rubric for Business Case

Section or Component	Description	Points*
Executive Summary	One or two page description of the overall business case document.	0-5
Overview and Introduction	Includes a brief business background, the current business situation, a clear statement of the business problem or opportunity, and a recommended solution at a high level.	0-5
Assumptions and Rationale	Includes issues driving the proposal (could be operational, human resource, environmental, competitive, industry or market trends, financial, or otherwise).	0-5
Program Summary	Includes a high level and then detailed description of the project, well-defined scope, objectives, contacts, resource plan, key metrics (financial and otherwise), implementation plan (high-level discussion and potential impacts), and key components to make this a success.	0-5
Financial Discussion and Analysis	Starts with financial summary then includes details such as projected costs/revenues/benefits, financial metrics, financial model, cash flow statement, and assumptions that went into creating financial statements. Total Cost of Ownership (TCO) calculations analysis would go in this section.	0-5
Benefits and Business Impacts	Starts with business impacts summary then includes details on all non-financial outcomes such as new business, transformation, innovations, competitive responses, organizational, supply chain, and human resource impacts.	0-5
Schedule and Milestones	Outlines the entire schedule for the project, highlights milestones and details expected metrics at each stage (what makes the go/no-go decision at each stage). If appropriate, this section can also include a marketing plan and schedule (sometimes this is a separate section).	0-5
Risk and Contingency Analysis	Includes details on risks, risk analysis, and contingencies to manage those risks. Includes sensitivity analysis on the scenario(s) proposed and contingencies to manage anticipated consequences. Includes interdependencies and the impact they will have on potential outcomes.	0-5
Conclusion and Recommendation	Reiterates primary recommendation and draws any necessary conclusions.	0-5
Appendices	Can include any backup materials that were not directly included in the body of the document such as detailed financial investment analysis, marketing materials, and competitor's literature.	0-5
	TOTAL POINTS	
	* Possible points for the category: 5 = FINANCIAL - Financial value can be calculated applying a cost/price or other valid financial benefit to a quantifiable benefit. 4 = QUANTIFIABLE - There is sufficient evidence to forecast how much improvement/benefit should result from the changes. 3 = MEASURABLE - Although this aspect of performance is currently measured, or an approximate measure could be implemented, it is not possible to estimate how much performance will improve when the changes are implemented. 2 = OBSERVABLE - Some discussion, but no measurement. 1 = Section acknowledged, no discussion. 0 = No acknowledgement of Section.	

Appendix B. Rubric Cost Risk Benefit Analysis *

Objective Type	Doing New Things	Doing Things Better	Stop Doing Things
Financial (5 points each)	State Benefit, Measure and Owner for each	State Benefit, Measure and Owner for each	State Benefit, Measure and Owner for each
Quantifiable (4 points each)	State Benefit, Measure and Owner for each	State Benefit, Measure and Owner for each	State Benefit, Measure and Owner for each
Measurable (3 points each)	State Benefit, Measure and Owner for each	State Benefit, Measure and Owner for each	State Benefit, Measure and Owner for each
INVESTMENT COSTS:			

* INSTRUCTIONS:
1. Complete a Cost Benefit Risk Analysis. Each entry is worth up to 5 points.
There is no limit to the number of "Doing Things" that can be identified.
2. For each benefit entered, the possible points are Financial =5, Quantifiable = 4, Measurable = 3, Observable =2, No measurement =1. See examples in Figure 7.7.
3. Each "Doing Thing", benefit, measure, and benefit owner must be stipulated to receive credit.
4. Total Investment Costs count for 10 points.

Diversity in Information Systems: Increasing Opportunities in STEM for Capable Students with Developmental and Intellectual Disabilities

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Abstract

The demand for graduates in STEM continues to expand in industry. To address the demand, not enough focus is on programs for students with disabilities having knowledge in STEM. This paper describes a post-secondary program at a school of computer science and information systems that is contributing marketability in STEM for moderately impaired but intellectually nimble students with developmental and intellectual disabilities. The findings of this paper denote contributions of academic identity, content learning of information systems technology and limited norms of sociability from the program, as a foundation for opportunities in STEM for the students. The results of this study can encourage other schools of computer science and information systems in pursuing special education programs in STEM for this niche population of students.

Keywords: college inclusion programs, disabilities, individualized education programs (IEP), information systems, post-secondary students with developmental and intellectual disabilities (IDD), special education programs in STEM, technology

1. BACKGROUND OF PAPER

A concern of industry is the continuing inadequacy in the availability of college graduates in science, technology, engineering and mathematics (STEM). A post-secondary education is considered critical for the bulk of industrial occupations in STEM (Takahashi et.al., 2017). The growth in the number of STEM students is not enough to facilitate however the growth in industrial innovation in new products involving skills in STEM (United States Equal Opportunity Commission, 2014). The United States Department of Commerce estimates growth of 20% by 2018 in the number of industrial occupations in STEM (Wilkie, 2014). The United States Equal Employment Commission estimates the number of opportunities in STEM to be higher than the number of post-secondary practitioners with skills in STEM (United States Equal Opportunity Commission, 2014), or 1.4 million positions to be in STEM but merely a .5 million graduates in STEM students to fill them in 2020 (Lohr, 2016). The incentive of an annual average of $81,000 in salary (Thompson, 2017) is not enough to fill them. The growth in positions in the sector of STEM is increasing more than in other industrial sectors (Hewlett et. al., 2008),

highlighting the importance of the availability of STEM students. The inadequacy in the availability of STEM students is concomitant with a considered inadequacy in the diversity of STEM students (United States Equal Opportunity Commission, 2014) that if addressed by colleges can alleviate the concern.

The inadequacy is considered due in part to the limited number of females and minorities, and individuals with disabilities, in programs of STEM (Bellman, Burgstahler, & Ladner, 2014). A particular group of interest to the authors is capable individuals with developmental and intellectual disabilities (IDD), a group of millennials desiring to be in college inclusion programs in STEM (Skibell, 2015, Boccella, 2016, & Kuehl, 2016) but not considered eligible (Ladner & Burgstahler, 2015), as capabilities of the higher-functioning of this group may not be discerned enough due to the impairments (Kim & Aquino, 2017). For example, determined students with autism spectrum disorders (ASD) are considered frequently to have higher skills in STEM more than students without the disorders (The Economist, 2016).

Higher-functioning students with developmental and intellectual disabilities at mid-spectrum with chromosomal disorders (e.g., Down Syndrome) frequently finish post-secondary programs in STEM so that they can be hired in industrial positions (Uditsky & Hughson, 2012), especially in small-sized technology firms (Silberman, 2015), such as in the Silicon Valley; and autistic students with less impairments have longer longevity in the positions. Such students can furnish independent insights in innovations of STEM and in new products (Mone, 2017) that may be lacking to those without disabilities (Ladner & Burgstahler, 2015, & Lazar et.al., 2017). There are in the country currently 250+ post-secondary programs for students with developmental and intellectual disabilities with a diversity of models (Canright, 2014) including STEM, and more programs are expected in 2017 – 2020 (Diament, 2015). These programs can address the concern of industry for skilled STEM students (Bellman, Burgstahler, & Ladner, 2014). Accordingly, this paper presents a model at the Seidenberg School of Computer Science and Information Systems of Pace University, as a foundational program for increased availability and diversity of skilled students in STEM.

2. INTRODUCTION TO PROGRAM

"Everyone desires the opportunity to reach their full potential" (Hublar, 2016)
The post-secondary model at the Seidenberg School of Pace University is devised as a certificate non-credit non-degree program in STEM for moderately impaired students with disabilities having individualized education plans (IEP) from middle / high schools. Though the students are moderately impaired with disabilities, they are free from disruptions and largely intellectually nimble and interested in learning STEM and non-STEM skills (Corrigan, 2016). The program is modeled on requirements from the Higher Education Act (HEA) of 2008: Programs for Students with Intellectual Disabilities in Higher Education Title VII – Part D-2 Excerpts (Grigal, Hart, & Weir, 2012) and on the Think College Standards, Quality Indicators, and Benchmarks for Inclusive Higher Education Initiative (Grigal et.al., 2012) for students with disabilities. The students are matched to the program based on capability and desire, as discerned by a non-profit AHRC New York City organization, a disability organization partner of the school, and by the school. The students with developmental and intellectual disabilities are included in the school with students without disabilities in a fully inclusive setting.

The program is devised as a coherent experience in exploring and in learning STEM that can help in identifying industrial opportunities in STEM (i.e. technology) for the students with disabilities. Following a course in *University 101*, the focus of the program is on courses in technology, which includes:

- *Computer Information Systems;*
- *Computer Programming*;
- *Creating with the Interactive Web*;
- *Information Technologies*;
- *Intermediate Microsoft Tools*;
- *Introduction to Computing Technology*;
- *Introduction to Information Technologies*;
- *Introduction to Programming*;
- *Java Programming*;
- *Multimedia User Interface Design*;
- *Problem Solving Using Lego Robotics*;
- *Social Media*;
- *Social Media Networking Technology*; and
- *Web Design for Non-Profit Organizations*.

From person-centered plans (Mount, 2000), and desired outcomes from the plans, the program can engage further interests and skills of the students in non-STEM courses, examples of which

are *Communication and Popular Culture*, *Contemporary History* and *Psychology of Women*, often involving the students with disabilities on projects in STEM and non-STEM with the students without disabilities, on self-directed teams.

The full program scope is 14 courses in STEM, as above, and 9 courses in non-STEM study, as exampled, of which the students with disabilities are in an average of 12 chosen courses, mostly in STEM, since 2013.

However, the curricular is expanded by extra-curricular experiences in STEM, such as the following:

- *Big Data Boot Camps (e*.g., Data Analytics Labs and Data Modeling Competitions);
- *Career Networking Nights* (e.g., Preparing for the Google Interview);
- *Computer Science Tech Talks* (e.g., Google Brain Team: Deep Learning with Python);
- *Computing Nerd Night Fights* (e.g., Hacker-Rank Nights);
- *Conservatory STEM Summers*;
- *Cybersecurity Hackathon Innovation Labs*;
- *Entrepreneurship Lab Mobile App Pitches (e*.g., My Everyday Pace);
- *Gaming in the Cloud Fest Programs;* and
- *Learn from a Legacy of Technology Leaders & Innovators - Speaker Spotlight Series* (e.g., Women in Technology).

The extra-curricular experiences furnish internship opportunities in the school for the students, as the Confucius Institute, as a foundation for occupational positions in technology.

The students with disabilities are further included in extra-curricular experiences in non-STEM recreation and sociality, such as the *Confucius Institute*, in the university, or 173 extra-curricular experiences in non-STEM (40) and STEM (133), since 2013.

There are an average of 2-3 students in the program in a semester, or a cumulative of 13 students with developmental and intellectual disabilities, a national norm number for post-secondary programs for such students (Grigal & Hart, 2010), during an average but flexible 3 years, since 2013.

The post-secondary program is not altered in expectations for the students with disabilities (Valls, & Kyriakides, 2013). However, they are assisted by companion mentor students without disabilities (Topping & Ehly, 1998, & Getzel, 2014) in their curricular experiences of identity and learning, with the concurrence of faculty, and in their extra-curricular experiences of sociality; and they are shadowed by the mentor peer students in the school and university. They are assisted by assistive resources (Gassner, 2016), such as apps on i-pads, communication devices, content displays and mobile scribes, furnished mostly by the non-profit organization, and by social networking services, such as MyPace, Snap Chat and Twitter. They are helped if they need other services (Barnhill, 2016), such as re-scheduling testing times. Literature indicates that students with disabilities can complete post-secondary programs, connecting experiences to industrial opportunities as real outcomes of the programs, if they have mentoring and other resources and services (Baer et. al., 2003, Hoffman, 2016, & Diament, 2017). Not clear, even given the resources and the services of the non-profit organization and the Seidenberg School of Pace University in this paper, is the contribution depth of the post-secondary program in STEM for the students with developmental and intellectual disabilities.

3. FOCUS OF PAPER

The focus of this paper is to evaluate the contribution depth of the post-secondary program of the Seidenberg School on the students with disabilities. The evaluation is of factors of *academic identity* (Singer-Freeman, Bastone, & Skrivanek, 2014) – Is the program favorably or non-favorably impacting the identity of the students as bona fide members of the school?; *content learning* (Thoms & Eryilmaz, 2015) – Is the program favorably or non-favorably impacting the learning of technology by the students?; and *norms of sociability* (Ehiyazaryan-White, 2012) – Is the program favorably or unfavorably impacting sociality skills of the students?, as an effective foundation for marketable skills in STEM. The factors are found in the literature and were investigated in preliminary analyses of the authors (Greene & Lawler, 2017; Lawler, 2016; and Lawler, 2013). The evaluation is apt as, despite the number of offered programs, limited numbers of eligible students with developmental and intellectual disabilities are effectively engaged in post-secondary programs (Kolodner, 2016) and even post-secondary professions (Schwarz, 2006, & Smith & Lowrey, 2017), such as STEM. The

literature is moreover scant on inclusion interventions for moderately impaired but intellectually nimble STEM students with developmental and intellectual disabilities. The results of this study can be helpful to instructors in information systems in learning practices for pursuing diversity of an enthusiastic niche population of STEM students.

4. METHODOLOGY OF STUDY

The methodology of this study consisted of different focus groups of the 13 students with disabilities, in the program in STEM in the Seidenberg School of Computer Science and Information Systems of Pace University, since 2013. The perceptions of the students with disabilities were evaluated by a checklist instrument on the contribution depth of impact of the 23 courses (14 STEM and 9 non-STEM) of the program as applicable, on the aforementioned factors of academic identity and content learning and on factor items, as defined fully in Tables 1 and 2 in the Appendix. The perceptions of the students with disabilities were evaluated further on the contribution of impact of the cumulative experiences in extra-curricular as applicable, on the aforementioned factor of norms of sociality and on factor items, also detailed fully in Table 3. The perceptions of the dimensions of the impact of the courses and of the experiences in identity, learning and sociality items were evaluated on a Likert-like scaling of 5 – very high impact, 4 – high impact, 3 – intermediate impact, 2 – low impact and 1 – very low impact, with an option of 0, on the students. The evaluations were consistent with the methodology engaged on the preliminary analyses of the program (Greene & Lawler, 2017; Lawler, 2016; and Lawler, 2013), in the community context of construct, content and face validity for this population of students with developmental and intellectual disabilities at the university.

The resultant quantitative data was interpreted from the Mat Lab 7.10.0 Statistics Toolbox (Evans, 2014) by the second author; and the resultant qualitative information was interpreted, in consultation with the instructors and the mentors in the program and with the students, by the third and first authors of this study.

5. ANALYSIS OF DATA AND DISCUSSION OF RESULTS

The analysis of the data on the post-secondary program is disclosing contributions of favorably high impact of academic identity (means=4.50/ 5.00) and content learning (3.92) but limited sociality (2.24). The courses in STEM are favorably impacting identity (4.49), content learning of technology (3.97) but limited norms of sociality (2.48); and the extra-curricular experiences in STEM are concurrently impacting identity, content learning of technology and norms of sociality, in the perceptions of the students with disabilities. The courses and the extra-curricular experiences in non-STEM study are concurrently impacting the factors favorably.

(Tables 1-3 detail the results of the study.)

Academic Identity

The administrative aspects of the program are enabling the academic identity of the students with disabilities. The students are easily engaging the course facilities and labs (4.42/ 5.00) of the Seidenberg School, easily enrolling in its systems (4.51), and easily navigating the library and research resources (4.49) of the university, as non-official students. They are accepted as equal course members by instructors and by students without disabilities (4.56). This is inspiring confidence skills for them to be members of the school like STEM students without disabilities. The development of an academic identity encourages expectations of a career identity in STEM.

Content Learning of STEM

From initial literacy (2.84/5.00 [STEM]), the courses in the program are enabling content learning in hard skills (3.97) in intermediate information systems subjects. The inclusion on projects is facilitating increased interest in STEM. Most of the projects are enabling increased learning in coding - computational methods for computational thinking - in technology, by involving the students with disabilities in individual contributor tasks and in cooperative group-learning (Gregory & Chapman, 2013) on mutual problem-solving tasks (3.81) This is impacting positively soft skills (3.69), such as perseverance, presentation, problem-solving, thinking and time management, impacting the increasing interest in STEM (Cox, Cekic, & Adams, 2010), as the students perform tasks on the teams. The students with disabilities are helped in increasing interactions on the tasks by non-technical and technical tools (Satriale, 2016) on the tasks (4.75); and they are helped without issue to the instructors or to the students without disabilities (4.38). Other prerequisites, such as Universal Design Learning (Thoma et.al., 2016) and Universal Design for Learner Support (Tobin, 2016), are helping in the program, as instructors, educated in the prerequisites, improve interactions with the students with disabilities.

The learning of intermediate skills in STEM (i.e. technology), even if not for skills as an engineering or coding wizard, and of liberal arts orientation skills, is a foundation for individualized plans for employment (IPE) that may be developed for the students by the non-profit organization. The foundation for marketable skills for industrial positions is highly motivating for these students.

Norms of Sociality

The experiences offered by the program are facilitating limited sociality of the students with disabilities. The experiences are indicating involvement in extra-curricular events, in memberships or non-memberships (3.46/5.00), notably in hackathons in technology, and in seminars (2.77 [STEM]), in the school or in the university. The experiences are further indicating holistic learning beyond sociality from peer students without disabilities (Schwarz, 2006, & Khan, 2015). The recognition for their roles are however not as pronounced in the school (1.31) or in the university (1.00), as their roles are limited by a focus on content learning. The socialization skills will be eventually marketable nevertheless especially if integrated with the skills in STEM.

Overall, the perceptions of the post-secondary program in the Seidenberg School are essentially indicating generally high satisfaction. The students with developmental and intellectual disabilities are learning practical skills beyond STEM for societal success (Alwell & Cobb, 2007) – 6 of the 13 are already in semi-professional positions through the non-profit organization and the school. With their skills, they are even learning to be self-advocates for themselves.

(Tables 2b and 2c document the content learning correlations and frequency distribution results of this study.)

6. IMPLICATIONS FOR PRACTICE

"Everyone should have the opportunity to go to college.' (Hublar, 2016)

The program in the Seidenberg School is enabling a college experience from both curricular and extra-curricular facets. Most of the students are engaging in a diversity of opportunities (Causton-Theoharis, Ashby, & DeClouette, 2009) in the discipline of STEM. The opportunities are facilitating outcomes of possibilities (Grigal & Hart, 2010) in STEM. In this process, the students with disabilities are formulating a portfolio of increased marketability of skills in STEM, focusing on technology. The implication is that a post-secondary program in STEM for higher-functioning students with developmental and intellectual disabilities is a feasible proposition for a school of information systems.

The program is existing from funding from the non-profit organization. The program is functioning from the internal resources of the university, such as the Department of Internal Technology, Health Services and the Office of Disability Services, that do not insist on more resources for the norm of a small number of students (Grigal & Hart, 2010). The program is functioning however largely from the mentor students and from the network of proactive professors who, with the political sponsorship of the Dean of the SEidenberg School and the Dean for Students of the university, are important in maintaining the program (Cerf & Johnson, 2016) with high finishing rates. The initiation of a post-secondary program for atypical students with disabilities is frequently an issue for schools in STEM or non-STEM not familiar with inclusion practices for this niche population of students (Causton-Theoharis, Ashby, & DeClouette, 2009). The implication for requirements for a school of information systems is that a post-secondary program in STEM for students with developmental and intellectual disabilities is an incremental proposition that requires the inventive integration of resources and services of a university.

The practices of the Seidenberg School are illustrative of other post-secondary Think College practices. Eligible students with disabilities do not have enough industrial opportunities if they are not included in a post-secondary program (Diament, 2016), even though industries have positions for them if the students have the required skills. The program in STEM is offering meaningful possibilities in technology to higher-functioning motivated students with disabilities at Pace University, moving beyond considered deficits of the impairments to the actual capabilities of the students (Gay, 2013) – can we afford to have other coding - such students become discouraged or intimidated without such programs? These programs posit a new positive reality for schools of information systems and for the students themselves. The final implication for practices is that special education programs in STEM are an important proposition for schools of information systems, in sourcing a neglected niche population of students with developmental and intellectual disabilities interested in learning skills in STEM, in order to address the demands of industries.

7. LIMITATIONS AND OPPORTUNITIES

The paper is constrained by perceptions of a limited number of students at one school of information systems focusing on technology. The paper is constrained further by its current dimension of heterogeneity that is limited to the needs of students with developmental and intellectual disabilities from one non-profit organization. However, this paper may be improved as diverse students with other disabilities (Brand & Valent, 2013) are included in the post-secondary program at the school, and intersections of the disabilities with other diversity, such as ethnic, gender, racial, religious and sexual, are as feasible included in the program, introducing an improved and inclusive intervention measurement study. Measurement of students with disabilities interested in non-STEM subjects, and more measurement of sociality, may be further improvement in a new paper. Nevertheless, this study, in the interim, may energize other schools of information systems in pursuing programs in STEM for this population of students.

8. CONCLUSION OF PAPER

This paper describes a post-secondary program for the diversity of students with developmental and intellectual disabilities in a school of computer science and information systems at a metropolitan university. The essence of the program is in engaging higher-functioning interested students with the disabilities in curricular and extra-curricular experiences of STEM inclusively like other students without disabilities. The goal of the program is in helping in proficiency in industrial possibilities for these students with disabilities.

The perceptions of the program are indicating that the academic identity and the content learning of marketable skills in technology, and the limited norms of sociality, are factors of the program furnishing satisfaction of the students. The importance of mentor peer students and networks of proactive professors sensitive to the students with disabilities is indicated by the authors. The importance of involvement of a non-profit organization, as a post-secondary source of the students with disabilities pre-evaluated to have potential to succeed in technology, is further indicated in this paper. The importance of the internal organizational services of the university is noted in this study. The post-secondary program of this study is a proposition that may be integrated in schools of information systems seamlessly with the institutional services of the university.

In summary, this paper presents an outreach proposition that can motivate other schools of information systems to pursue inclusiveness programs in STEM for this population of students – a compelling imperative beyond any moral necessity.

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Editor's Note:

This paper was selected for inclusion in the journal as an EDSIGCON 2017 Meritorious Paper. The acceptance rate is typically 15% for this category of paper based on blind reviews from six or more peers including three or more former best papers authors who did not submit a paper in 2017.

APPENDIX

Table 1: Evaluation of Post-Secondary Special Education Program – Academic Identity

	STEM and Non-STEM		STEM	
Academic Identity Factor	**Means**	**Standard Deviations**	**Means**	**Standard Deviations**
Student was admitted to the course without administrative difficulty.	4.51	0.77	4.56	0.76
Student was easily engaged into the course facilities and labs.	4.42	0.85	4.41	0.87
Student was easily enrolled on to the course black board and e-portfolio id systems of the university.	4.51	0.80	4.56	0.80
Student was easily involved in navigating course library, material and research resources of the school and the university.	4.49	0.70	4.41	0.76
Student was accepted as an equivalent course member by the course professor and by the students.	4.56	0.70	4.50	0.76
Overall	4.50	0.76	4.49	0.79

Table 2: Evaluation of Post-Secondary Special Education Program – Content Learning

	STEM and Non-STEM		STEM	
Content Learning Factor	**Means**	**Standard Deviations**	**Means**	**Standard Deviations**
Student was demonstrating initial literacy skills in the course subjects by the beginning of the semester.	2.83	1.29	2.84	1.35
(F2) Student was involved with other course students on project teams.	3.84	1.11	3.81	1.18
(F3) Student was involved in course Q&A with the professor and with other students.	3.53	1.20	3.41	1.19
(F4) Student was demonstrating hard proficiency skills in the course subjects by the end of the semester.	4.12	0.73	3.97	0.69
(F5) Student was demonstrating other proficiency soft skills by the end of the semester.	3.84	0.87	3.69	0.90
(F6) Student was demonstrating a positive presence in the course in the semester.	3.91	0.95	3.78	0.94
(F7) Student was supported by non-technical resources without issue to the course, the professor and the other students.	4.81	0.45	4.75	0.51
(F8) Student was supported by technical tools without issue to the course, the professor ad the other students.	4.51	0.63	4.38	0.66
Overall	3.92	0.90	3.97	0.87

Table 2a: Evaluation of Post-Secondary Special Education Program – Content Learning - Curricular in STEM

	STEM	
Content Learning in Courses of STEM	**Means**	**Standard Deviations**
Computer Information Systems	4.38	0.71
Computer Programming	3.13	0.88
Creating with the Interactive Web	4.17	0.51
Information Technologies	3.57	0.92
Intermediate Microsoft Tools	(-)	(-)
Introduction to Computing Technology	3.54	0.87
Introduction to Information Technology	(-)	(-)
Introduction to Programming	3.00	0.79
Java Programming	(-)	(-)
Multimedia User Interface Design	4.67	0.58
Problem Solving Using Lego Robotics	3.90	1.08
Social Media	(-)	(-)
Social Media Networking Technology	3.25	0.71
Web Design for Non-Profit Organizations	(-)	(-)

(-) Evaluations were incomplete in inputs by the students.

Table 2b: Kendall's Tau b Non-Parametric Correlations of Factor Pair Ratings – Content Learning – Curricular in STEM (Corresponding to Table 2)

Content Learning Factor	F1	F2	F3	F4	F5	F6	F7
F2	0.319*						
F3	-0.119	0.045					
F4	0.362*	0.439**	0.238				
F5	0.263	0.283	-0.169	0.018			
F6	0.248	0.562**	0.322*	0.433**	0.206		
F7	-0.162	0.257	-0.204	0.080	0.218	0.184	
F8	0.220	0.294	0.078	0.290	0.180	0.383*	0.336*

*Correlations are significant at the 0.01 level (2-tailed).
**Correlations are significant at the 0.05 level (2-tailed).

Table 2c: Frequency Distributions of Ratings – Content Learning – Curricular in STEM (Corresponding to Table 2)

	Frequencies							
	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Impacts								
5	3	12	8	7	5	10	25	15
4	7	8	5	17	16	6	6	14
3	12	7	13	8	7	15	1	3
2	4	4	4	0	4	1	0	0
1	4	1	2	0	0	0	0	0
0	2	0	0	0	0	0	0	0

Table 3: Evaluation of Post-Secondary Special Education Program – Sociality

	STEM and Non-STEM		STEM	
Sociality Factor	**Means**	**Standard Deviations**	**Means**	**Standard Deviations**
Student was involved in memberships or non-memberships in extra-curricular clubs of recreation and socialization in the school and / or university.	3.19	1.83	3.92	1.44
Student was involved in extra-curricular non-membership events in the school and / or university.	3.46	1.75	3.46	1.39
Student was involved in extra-curricular seminars on hard and / or soft skills in the school and / or university.	2.27	1.95	2.77	2.17
Student was involved as a non-participant or participant in recreation / sports in the university.	1.27	1.80	0.92	1.66
Student was prominently recognized for her / his role in membership and/ or non-membership clubs, events, and / or seminars in the school and / or university.	1.00	1.57	1.31	1.80
Overall	2.24	1.78	2.48	1.69

Attitudes Toward Course Delivery: A Multi-University Study of Online, On-ground, And Hybrid Instruction

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Abstract

This study examines the effectiveness of on-ground, online, and the hybrid delivery methods through a quantitative survey of students who were enrolled in Computer Information Systems courses at three universities during the 2016-2017 academic year. The results of the survey indicate that respondents preferred the on-ground course delivery method as opposed to the online course delivery method. Completely online course delivery was perceived as moderately effective with significant demographic differences based on both gender and age. Females and older students expressed completely online course delivery as more effective. The hybrid course delivery method was perceived as being more effective than the completely online course delivery method and the on-ground course delivery method was perceived as being the most effective. There were no significant demographic differences based on gender or age for hybrid or on-ground course delivery method.

Keywords: Online Education, Hybrid Learning, Web-Based Learning, Distance Learning, CIS Curricula

1. INTRODUCTON

Over the last decade, online and hybrid delivery methods have emerged as fundamental influences in educational delivery systems in higher education. The Babson Survey Research Group's Thirteenth Annual Report of the state of online learning in U.S. Higher education (Allen &

Seaman, 2016) reported that of 2,500 U.S. colleges and universities surveyed, students enrolled in online courses have increased from about 1.6 million in 2002 to 5.8 million in 2014. Of these 5.8 million students, 2.85 million were taking all their courses online and 2.97 million were taking some of their courses online. More than one in four students (28%) now take at least one online course (a total of 5,828,826 students, a year-to-year increase of 217,275). Additionally, the number of students not taking any online courses dropped by 434,236 from 2012 to 2013 and by 390,815 from 2013 to 2014.

Although the online and hybrid delivery methods continue to grow rapidly, many questions remain concerning the practicality and reliability of these formats, particularly from the student perspective in relation to Computer Information Systems (CIS).

Courses in CIS curricula as well as Information Technology or Computer Science range from instruction in computer programming languages, which requires hands-on development and extensive drill and practice to courses involving theoretical concepts; both elements can require an increased interaction with CIS faculty. It is not yet clear if online learning methods are advantageous to the delivery of such course content. Furthermore, it is not clear as to what degree online learning is effective in delivering CIS-specific course content.

The purpose of this study is to collect insights into students' perceptions of the online, hybrid and traditional on-ground delivery methods in relation to CIS courses. The results raise important considerations about using these delivery methods for CIS instruction. Specifically, the study intends to answer the following research questions:

1) What is the preferred course delivery method (online or on-ground) for CIS students and are there differences by gender or age?
2) How do CIS students rate the overall effectiveness of courses delivered COMPLETELY online and are there differences by gender or age?
3) How do CIS students rate the overall effectiveness of courses delivered via hybrid methods (partially online and partially on-ground) and are there differences by gender or age?
4) How do CIS students rate the overall effectiveness of courses delivered on-ground and are there differences by gender or age?

2. DEFINITIONS

For this study, *online* courses are defined as those in which 100 percent of the course content is delivered online. *On-ground* courses (traditional or "face-to-face" instruction) are defined as courses in which 100 percent of the course content is delivered in the on-ground classroom. The remaining alternative, *hybrid* (also called blended learning or partially online learning) involves a course that is partially delivered online and partially delivered in the classroom (i.e., between 30 percent and 80 percent of the course content is delivered online).

In addition to completely online courses and/or programs, the three universities involved in this study require online access to basic course information such as the syllabus, assignments and other resources even for on-ground courses. On-ground courses that incorporate such supplements are frequently considered to be online courses. However, for this research, courses that make use of these Web-based supplements are not considered online courses but are, instead, regarded as on-ground courses with online components or supplements.

3. LITERATURE REVIEW

A comprehensive meta-analysis research conducted by the U.S. Department of Education examining 12-year experimental and quasi-experimental studies found that despite what appears to be strong support for online learning, the studies in this meta-analysis do not demonstrate that online learning is superior as a delivery method. In many of the studies that involved a preference for online learning, the online and classroom conditions differed in terms of time spent, curriculum and pedagogy (Means, Toyama, Murphy, Bakia & Jones, 2009). This research also indicated that a blend of online and "face-to-face" instruction has been more effective (Means et al., 2009), which provides a rationale for the effort required to design and implement blended approaches.

Dobbs, Waid and del Carmen (2009) measured students' perceptions of online and on-ground course experiences and found that more students regarded on-ground courses to be easier than online courses. The participants of the study consisted of 180 students who were enrolled in online courses and 100 students who were enrolled in on-ground (traditional "face-to-face") courses. Student views about online education varied greatly between those who had never taken an online course and those who had taken

such courses. Those students with no online course experience felt that the faculty would have low expectations, but students who had taken at least one online course believed that high expectations were common with faculty. The study also found that the acceptance of online education increased as the number of online courses taken increased.

To determine how satisfied students were with both online and partially online courses, as well as to determine the factors that contribute to student satisfaction and dissatisfaction with online course delivery methods, Cole, Shelley, and Swartz (2014) conducted a three-year study involving 553 undergraduate and graduate students enrolled in business degree programs. The authors found that, overall, students were moderately satisfied with fully-online courses. However, the study revealed that the participants were slightly more satisfied with hybrid/partially-online courses. The students reported "Convenience" as the factor that contributed most to *satisfaction*. "Lack of interaction" (with both the professor and other students) was cited as the factor that contributed most to *dissatisfaction* with online courses (p. 122).

Ilgaz and Gülbahar (2015) developed a research model that involved "e-Readiness" and "e-Satisfaction." This model was developed to comprehensively measure a student's readiness *before* taking online courses, and the resulting satisfaction of students *after* taking online courses. The authors surveyed over 1,500 undergraduate and graduate students and discovered that students begin online classes with specific expectations; therefore, meeting or not meeting these expectations directly impacts students' satisfaction levels. Students expect to have an effective learning experience that emulates the physical classroom by "…interacting with the instructors and other participants" (p. 183). The authors also found that students are most satisfied with online classes if their expectations regarding "instructional content, communication and usability, and teaching process" were met by their online learning experience (p. 183).

Vidanagama (2016) conducted a study involving 209 undergraduate students enrolled in computer-related degrees. The author used the *Technology Acceptance Model* (TAM) to ascertain if several factors associated with online learning (e.g., perceived enjoyment, previous attitude, and perceived usefulness) are affected by technology. The author found that, among computing students, the perceptions of online courses can be affected by technological adequacy and ease of use. Students enrolled in computing degrees are more satisfied with online learning when the technological environment (*Learning Management System*, software used in courses, etc.) performs adequately and is easy to use. It can be inferred from this study that students in computing fields are *more critical* than students in other degree fields of the *technological environment* involved in online course delivery. This finding creates an additional challenge for educators who teach computer-related subjects in an online or partially-online environment.

To examine specifically students' perceptions of course delivery methods in the computing field, Kovacs, Peslak, Kovalchick, Wang and Davis (2017) found that only 54% of students preferred traditional on-ground course delivery and 46% preferred online course delivery.

4. METHODOLOGY

The current research involved the administration of a Web-based survey created in QuestionPro that consisted of 34 closed-ended questions. This survey was administered during the 2016-2017 Academic Year to students enrolled in CIS courses at three universities: one private, one state-owned and one state-related. The students at the state-owned university and the state-related university only included those seeking a bachelor's degree while the students at the private university included those seeking bachelor's, master's and doctoral degrees.

The students completed the survey online while enrolled in an on-ground, hybrid or online CIS course. A total of 287 students responded to the survey. To address the research questions, statistical analysis and tests were conducted in Statistical Package for the Social Sciences (SPSS 22.0) statistical software.

5. RESULTS

Demographics

The statistical analysis of the results begins with the general demographics of the survey participants. As shown in Table 1, out of a total of 287 survey respondents, 91.6% were valid results. And among the valid results, about 29% from a state university, 22% from a state-affiliated university and 49% from a private university. These universities provide a diverse socio-economic mix of participants.

University Type		Valid Percent
Valid (n=263)	State U.	28.5
	State-related U.	22.1
	Private U.	49.4
	Total	100.0

Table 1: Percentage of survey respondents by university

Due to the inherent gender bias in CIS programs, the ratio of male to female was fairly high. As shown in Table 2, about 81% of the survey respondents were male, 18% were female and 1% identified as other.

Gender		Valid Percent
Valid (n=220)	Male	80.8
	Female	18.3
	Other	.9
	Total	100.0

Table 2: Percentage of survey respondents based on gender.

The survey respondent age group was skewed with the general population but reflective of the specific population for receiving college education. As shown in Table 3, about 47% of the survey respondents were in the 18-21 age group, 29% were in the 22-30 age group , and 23% were in the over 30 age groups (15% in 31-40 age group, 4% in 41-50, 3.6% in 51-60, and 0.9% over 60).

Age Group		Number	Valid Percent
Valid (n=220)	18-21	104	47.3
	22-30	64	29.1
	31-40	33	15.0
	41-50	9	4.1
	51-60	8	3.6
	Over 60	2	.9
	Total	220	100.0

Table 3: Percentage of survey respondents by age group

Answers to Research Questions

Research Question 1: What is the preferred course delivery method (online or on-ground) for CIS students and are there differences by gender or age?

As reported in Kovacs, Peslak, Kovalchick, Wang and Davis (2017), 54% of students preferred traditional on-ground course delivery and 46% preferred online course delivery when answering the survey question "If given a choice to take the same course in an online format or an on-ground format, would you select the online format?"

There is a significant difference in course delivery preference of on-ground vs. online based on gender, as shown with the results of an ANOVA test depicted in Table 4. Male respondents had a higher mean preference (lesser effectiveness) of on-ground course delivery method than female. In a post hoc test, this difference between male and female respondents was statistically significant with p= .081.

Gender	N	Mean
Male	177	1.616
Female	40	1.425
Other	2	1.000
Total	219	1.575

Table 4: Preference for on-ground vs. online course delivery method by gender (p=0.081)

When examining age, a significant difference was also found with p=.005. Older students preferring on-ground course delivery (Table 5), except for the 51-60 age group, which found on-ground course delivery less effective.

Age Group	N	Mean
18-21	104	1.683
22-30	64	1.500
31-40	33	1.455
41-50	9	1.222
51-60	8	1.750
Over 60	2	1.000
Total	220	1.573

Table 5: Preference of on-ground vs. online course delivery method by age group (p=0.005)

Research Question 2: How do CIS students rate the overall effectiveness of courses delivered COMPLETELY online and are there differences by gender or age?

In general, effectiveness of completely online course delivery is moderate in this survey. As shown in Table 6, 73% of survey respondents found the completely online delivery method at least somewhat effective, but only 9% found this delivery method very effective. 27% found it somewhat ineffective to very ineffective. Clearly, there is a quality gap expressed here that can be improved. Efforts should be made to further study the reasons behind the lack of perceived effectiveness.

Perceived Effectiveness		Percent	Valid Percent
Valid	Very effective	5.2	8.9
	Effective	19.5	33.1
	Somewhat effective	18.5	31.4
	Somewhat ineffective	8.4	14.2
	Ineffective	5.2	8.9
	Very ineffective	2.1	3.6
	Total	58.9	100.0
Missing	System	41.1	
Total		100.0	

Table 6: Perceived effectiveness of courses delivered completely online

Table 7 shows significant gender differences were found between males and females concerning effectiveness of courses delivered completely online. Males, on average, classified completely online delivery as only somewhat effective; whereas, females classified this delivery method midway between effective and somewhat effective. Differences were significant at p = .075.

Gender	N	Mean
Male	130	2.992
Female	29	2.552
Total	159	2.912

Table 7: Effectiveness of courses delivered completely online by gender (p=0.075)

Regarding the effectiveness of completely online course delivery, there was also found to be a significant difference at p=.049 based on age group (refer to Table 8). Younger students found the courses delivered completely online to be less effective. This supports our prior finding that younger students prefer on-ground course delivery. Again, there is an anomaly with the 41-50 age group, which also rated less effectiveness.

Age Group	N	Mean
18-21	71	3.113
22-30	46	2.957
31-40	30	2.667
41-50	6	1.667
51-60	5	3.000
Over 60	2	2.000
Total	160	2.913

Table 8: Effectiveness of courses delivered completely online by age group (p=0.049)

Research Question 3: How do CIS students rate the overall effectiveness of courses delivered via hybrid methods (partially online and partially on-ground) and are there differences by gender or age?

As shown in Table 9, in general, perceived effectiveness of hybrid courses (i.e., delivered partially online and partially on-ground) is higher than the perceived effectiveness of courses delivered completely online. 84% of survey respondents found the hybrid delivery method at least somewhat effective with 14% found this delivery method very effective. Only 16% found it somewhat ineffective to very ineffective. There is again a quality gap expressed here that can be improved. Efforts should be made to further study the reasons behind the improved perceived effectiveness.

Perceived Effectiveness		Valid Percent
Valid	Very effective	13.8
	Effective	42.5
	Somewhat effective	27.5
	Somewhat ineffective	9.0
	Ineffective	4.2
	Very ineffective	3.0
	Total	100.0

Table 9: Perceived effectiveness of the hybrid course delivery method

Contrary to the completely online course delivery method, neither age nor gender differences were found to be significant in relation to the effectiveness of courses delivered in a hybrid manner (refer to Table 10 and Table 11).

Gender	N	Mean
Male	129	2.628
Female	29	2.276
Total	158	2.563

Table 10: Perceived effectiveness of courses delivered in a hybrid manner by gender (not significant)

Age Group	N	Mean
18-21	71	2.437
22-30	46	2.870
31-40	29	2.414
41-50	6	2.500
51-60	5	2.600
Over 60	1	2.000
Total	158	2.563

Table 11: Perceived effectiveness of courses delivered in a hybrid manner by age group (not significant)

Research Question 4: How do CIS students rate the overall effectiveness of courses delivered on-ground and are there differences by gender or age?

As shown in Table 12, the respondents rated the on-ground course delivery method with the highest effectiveness. 92% of survey respondents found the on-ground delivery method at least somewhat effective, while 31% found this delivery method very effective and 43% found it effective. Only 8% found it somewhat ineffective to very ineffective. There is a quality gap expressed among online, hybrid and on-ground course delivery methods. Efforts should be made to further study the reasons behind the high perceived effectiveness of on-ground course delivery and shed insights to improve hybrid and complete online course delivery.

Perceived Effectiveness		Frequency	Valid Percent
Valid	Very effective	52	31.1
	Effective	72	43.1
	Somewhat effective	30	18.0
	Somewhat ineffective	5	3.0
	Ineffective	6	3.6
	Very ineffective	2	1.2
	Total	167	100.0
Missing	System	120	
Total		287	

Table 12: Perceived effectiveness of the on-ground course delivery method

Gender	N	Mean
Male	129	2.109
Female	29	1.793
Total	158	2.051

Table 13: Perceived effectiveness of courses delivered on-ground by gender (not significant)

Age Group	N	Mean
18-21	71	1.859
22-30	46	2.087
31-40	29	2.414
41-50	6	2.667
51-60	5	1.600
Over 60	1	2.000
Total	158	2.051

Table 14: Perceived effectiveness of courses delivered on-ground by age group (not significant)

Similar to the hybrid course delivery method, neither age nor gender differences were found significant for effectiveness of on-ground course delivery (refer to Table 13 and Table 14).

6. CONCLUSIONS

The research surveyed undergraduate, graduate and post-graduate CIS students in three universities during the 2016-2017 academic year to examine the perceived effectiveness of course delivery methods and whether demographic differences exist based on gender and age. Limitations of the study include use of three Northeast Universities, differences in courses and programs within these Universities and less than 100% participation for most questions although our response rate far exceeds the general expected response rate of 30-40% for internal surveys. (Surveygizmo, 2017). Also we feel that we feel that by diversifying our survey to three different Universities as well as different types of Universities improved the overall accuracy of our data. Many prior peer-reviewed studies have only surveyed one University.

The results showed that the survey respondents preferred the on-ground course delivery method over the online course delivery method. Demographic differences for course delivery effectiveness (on-ground vs. online) were significant based on both gender and age, with males and younger students expressing the most preference for the on-ground vs. online course delivery method. Completely online course delivery was perceived as moderately effective with significant demographic differences based on both gender and age. Females and older students expressed completely online course delivery as more effective. The hybrid course delivery method was perceived as being more effective than the completely online course delivery method. There were no significant demographic differences based on gender or age for hybrid course delivery method. Finally, the on-ground course delivery method was perceived as being the most effective and there were no significant demographic differences based on gender or age for on-ground course delivery method.

These findings suggest that there is a difference in perceived effectiveness of completely online, hybrid and on-ground course delivery methods for students enrolled in CIS courses and demographic differences in gender and age do exist. Further studies are needed to examine the reasons behind the lack of perceived effectiveness of both completely online and hybrid course delivery methods and to address

the demographics differences in gender and age. Finally, with regard to the possible conclusion that students should take more face-to-face courses, this is not the objective of the study and should not be a conclusion. The study is a measure of current perceptions of online courses. The fact that they are perceived less favorably is a call to action for improvements in online delivery methods. Online courses and options for a variety of students are a given. The genie will not return to the bottle. Rather we need to improve online methods so that similar perceptions and results are achieved via online courses.

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Active Learning and Formative Assessment in a User-Centered Design Course

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Abstract

Trends in higher education call for teachers to do more to provide students an engaging and meaningful classroom experience. When active learning activities are added to classes, students interact and investigate topics in an interactive manner instead of relying solely on lecture to learn content. Often planned learning activities can also serve as formative assessments which support instruction and learning as they provide feedback to both students and instructor. This paper reviews literature related to active learning and the use of formative assessments. Then five different activities that were used as formative assessments in a user-centered design course are explained. Students responded to a survey asking about the learning benefit and enjoyment of the activities. Survey results, discussion, limitations, and comments about future ideas are also included.

Keywords: active learning, formative assessment, student perceptions, Human Computer Interaction (HCI), User-centered design

1. INTRODUCTION

Higher education is experiencing many changes and challenges with shrinking state budgets, fewer available students, pressure to build new facilities, and deeply discounted tuition rates (Marcus, 2017). These challenges prompt colleges to look more carefully at their priorities and determine ways to retain more of their current students. The emphasis on current students can also be seen in the classroom as we experience a shift from a teacher-centered emphasis where a faculty member lectures and students sit passively in class to student-centered approaches to learning (Lumpkin, Achen, & Dodd, 2015).

Researchers are finding that college faculty need to do more than just lecture during class (Keeley, 2011; Lavy & Yadin, 2010; Lumpkin et al., 2015). Heinerichs, Pazzaglia, and Gilboy (2016) emphasized that exposing students to lectures limits students to "remember" and "understand," the lowest two levels of Bloom's taxonomy. In addition, teachers who only lecture during class need to rely on student questions in class or during office hours to estimate student learning (Heinerichs et al., 2016). Lectures are less effective for keeping students engaged, lacking the communication needed for effective feedback (Lavy & Yadin, 2010). Without this feedback loop, "what we think we are teaching our students is not necessarily what they are learning" (Owen, 2016, p. 168).

This paper begins with a review of literature related to the use of both active learning activities and formative assessment in classrooms. Then several examples of how active learning and formative assessment were used in a college user-centered design (HCI) course are explained. The results of a student survey are also shared.

2. LITERATURE REVIEW

Active learning can be defined as "any activity encouraging students to participate in learning approaches engaging them with course material

and enhancing critical thinking as they make applications beyond the classroom" (Lumpkin et al., 2015, p. 123). While lectures can still be used, the emphasis is on engaging students during class. Engagement is encouraged in today's classrooms and can take on many forms including collaborative learning, problem-based learning, or cooperative learning (Hyun, Ediger, & Lee, 2017). Several studies examined the impact of active learning on student attitude and learning. Most studies report that active learning positively influences student learning as students comprehend and remember new content better (Hyun et al., 2017).

Some teachers prefer to combine lectures and learning activities. Incorporating group work as class activities does not mean the class must be lecture-free (Cavanagh, 2011; Cooper, MacGregor, Smith, & Robinson, 2000). In one study, large classes were presented with a combination of lecture and cooperative learning activities, each part lasting 10-15 minutes. In one session, students were exposed to two or three learning activities including large group discussion, small group or pair activities, and case studies. Nearly all of the participants indicated the activities helped them learn and understand the content while all of the participants agreed that the activities kept them interested and paying attention during class (Cavanagh, 2011). Research modeling, role playing, and problem-based learning were used as active learning and formative assessments in another large group study in a psychology course. The common themes of the free-form student responses were engagement and retention of material (Winstone & Millward, 2012).

Lumpkin et al. (2015) used exploratory writing assignments, small group and pair discussions, minute papers, and oral reports in an effort to incorporate active learning in five different courses. Students reported the activities helped to clarify the material and increase their understanding and recall. Activities were described as "an invigorating break, interesting, interactive, and enjoyable" (Lumpkin et al., 2015, p. 129).

Activity-based learning design was incorporated in a GIS map drawing exercise which allowed thinking and doing to be connected. The students who had the exposure to these activities and feedback did better on their final assessment than students in a previous semester when the activities were not used (Srivastava & Tait, 2012).

Multiple studies have found that small group activities are an effective way to allow students to engage in material (Cooper et al., 2000; Griffiths, Kutar, & Wood, 2010; Lumpkin et al., 2015). Students working collaboratively not only benefit from hearing others which may prompt them to look for better answers (Lavy & Yadin, 2010) but also feel the need to contribute higher quality ideas since others will be listening to their ideas, too (Griffiths et al., 2010). Cooper et al. (2000) found that the small group activities increased critical thinking and confidence in students while also increasing class attendance. Students in the Lumpkin et al. (2015) study showed overwhelming support for the use of pair and small group work to improve their learning.

Clearly many of the examples of active learning include group work where it would be best if students were physically arranged in groups in classrooms. College classrooms are often not set up with tables or movable furniture. One study looked at sixteen classes taught in either an active learning classroom (with round tables, multiple flat-panel display projectors, a glass marker board, and central teacher station) or a traditional lecture classrooms with desks. The active learning pedagogy was a significant predictor variable of student satisfaction in both the traditional and active learning classrooms. The number of active learning methods incorporated in the class were positively associated with student satisfaction (Hyun et al., 2017). Students indicated a preference for the active learning classrooms, but evidence shows a traditional classroom arrangement does not have to be an impediment to small group activities.

Another way for students to be more involved in the classroom is to provide formative assessment opportunities. When students think of assessment, they think about tests and grades which are generally related to summative assessments used to evaluate learning. Black and Wiliam (2009, p. 9) describe formative assessment as "Practice in a classroom is formative to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better or better founded, than the decisions they would have taken in the absence of the evidence that was elicited." Formative assessments are designed to improve

learning and support instruction (Crisp, 2012; Keeley, 2011). Formative assessments are normally not graded and often are anonymous (Angelo & Cross, 1993). An assessment can be considered formative if "a teacher uses information from a particular assessment to track learning, give students feedback, and adjust instructional strategies in a way intended to further progress toward learning goals" (Greenstein, 2010, p. 29). The introduction of formative assessments fits with activities being done already in a classroom and allows students to examine their own ideas as well as hear from their peers (Keeley, 2011).

Most agree that teachers should provide a variety of assessment tasks (Crisp, 2012). Summative assessments are typically required in order to earn a grade, but formative ones are not. There are many advantages to using formative assessments. When students have completed formative assessments, they can be less dependent on teachers and can better prepare for future assessments and assume greater responsibility for their own learning (Owen, 2016; Srivastava & Tait, 2012). In fact, multiple sources emphasize the validity of the feedback loop that is available on an ongoing basis when formative assessments are used (Crisp, 2012; Heinerichs et al., 2016; Yu & Chia-Ling, 2015). Teachers can use the assessments to make data-driven decisions about how to adjust and plan for future instruction (Keeley, 2011).

The biggest drawback to incorporating formative assessments and active learning activities is that teachers spend more time preparing for class (Hyun et al., 2017; Lavy & Yadin, 2010; Winstone & Millward, 2012). Another concern is using class time for activities and formative assessments reduces the available time to cover the content in class. This means some content may not be included; however, better learning ranks higher than just covering more material (Lumpkin et al., 2015).

There are entire books devoted to formative assessment and the different techniques that can be used in the classroom. Some common techniques are using clickers to test knowledge or take a poll, muddiest point to find out what students do not understand, and minute papers to have the students summarize something from class (Angelo & Cross, 1993; Heinerichs et al., 2016). Researchers have attempted to create categories or strategies to classify formative assessments. Wiliam and Thompson (2006, p. 64) identified five key strategies, "1. Clarifying and sharing learning intentions and criteria for success. 2. Engineering effective classroom discussions, questions, and learning tasks that elicit evidence of learning. 3. Providing feedback that moves learners forward. 4. Activating students as instructional resources for one another. 5. Activating students as the owners of their own learning." Keeley (2011) used the categories: engagement and readiness, eliciting prior knowledge, exploration and discovery, concept and skill development, concept and skill transfer, and self-assessment and reflection. The formative assessments in this course fit into one or more of the strategies or categories identified by William and Thompson (2006) and Keeley (2011).

In this study, both active learning activities and formative assessments were used. Other studies have also used both including Heinerichs et al. (2016), Srivastava & Tait (2012), and Winstone & Millward (2012). The active learning activities can serve as a basis for evaluation and feedback to fulfill formative assessment conditions.

3. USER-CENTERED DESIGN COURSE ACTION RESEARCH

This action research project was undertaken to get feedback from students on the use of various activities and formative assessments in a User-Centered Design course with Human Computer Interaction (HCI) content. Twenty-two Information Systems graduate students were enrolled in the course which met for 75 minutes two times a week. The class used a lecture and activity approach with a short lecture at the beginning of most class periods and then activities, often group or pair activities where the students would share their findings with the rest of the class. Five activities that were used in the class and served as formative assessments are described next. None of the following activities had points associated with them; students knew class participation was a regular part of the course.

The first activity was a key to class (sometimes referred to as a ticket to class or entrance slip). The key to class is a learning task to produce evidence of learning and provide a way to gauge engagement and readiness. It was assigned at the end of the first class meeting, and students were asked to identify an item or device they had trouble figuring out. They were to describe the design problem and to determine at which stage the action failed. The book "The Design of

Everyday Things" by Donald Norman was being studied at this point.

As students entered the classroom on the second day of class, they handed me their paper with the answers. I then randomly selected papers, read some of them aloud, and then we discussed their answers. Discussion can stimulate student interest in the subject as well as provide feedback on how well the students are understanding the content (Greenstein, 2010). The students appeared to enjoy hearing what others had discovered and it led to a lively discussion. From this assessment, it was clear that they were becoming more cognizant of design in their daily living but were confused with the stages of action. Adjustments were made to include more examples of the steps in the upcoming classes.

Muddiest point asks students to share what the most confusing or unclear part of an assignment (Greenstein, 2010). The muddiest point exercise serves as a stimulus for providing feedback to advance learners as well as enhancing concept and skill development. The students were still studying the Norman book when they were instructed to read a chapter before class and then write 2 questions. The first question was their muddiest point. The second was a discussion question the class could use. As students entered class, they handed in their papers which were quickly scanned to see what the most common confusing points were. Muddiest point exercises are easy to give but require the teacher to quickly analyze answers and determine what to share. Mental models was a common muddiest point so that part of the lecture was explained more carefully. The discussion questions were not used, but it was evident that students struggled to come up with questions that could be discussed.

The next activity was planned right before the first exam. Student-generated test questions can serve as a summary assessment as students are expected to review the material to come up with the questions (Greenstein, 2010). These questions allow teachers to see what content the students believe to be most important, what they deem to be fair and reasonable test questions, and how well they know the material in order to answer the questions (Angelo & Cross, 1993). Student-generated test questions compel students to take ownership for their own learning and allow self-assessment. Having the students serve in a different role could provide them some insight into the assessment process (Lavy & Yadin, 2010). Yu and Chia-Ling (2015) referenced several studies where student-generated questions helped students become more active learners, concentrate on important ideas, reflect on material, and improve problem-solving abilities. Their latest research went further to have students create and edit a test found that students noted cognitive advantages including the opportunity to apply material instead of memorize and use higher-order thinking skills (Yu & Chia-Ling, 2015).

Students were asked to write six questions that could be included on the first exam. Class time was used to review the questions and answers, providing a review of the material covered. Many of the questions students submitted were similar in concept and wording. The students quickly realized that writing test questions was hard as often more than one of their multiple choice options could be correct. I also made comments like "I like this question" or "I would not ask this" and then explained my reasoning. Some of the questions were used or adapted slightly and used on the first exam.

One class topic was usability testing with paper prototyping as well as using electronic methods. Two videos were selected to demonstrate these ideas. Prior to class, the instructor watched the videos and created an empty outline. An empty outline includes a partially completed outline with spaces for the student to complete during the lesson (Greenstein, 2010). The empty outline activity fits into clarifying and sharing criteria for success as the students knew what they needed to learn from the videos. The students submitted their completed empty outlines at the end of the videos, and the outlines were analyzed to see what concepts the students knew well and which ones were unclear. For example, students knew the messages to share with the subjects in a usability test as their answers were thorough and appropriate. This is probably because both videos addressed this step. The part of the outline that was incorrect for many was the role of content in paper prototyping. In the next class, this concept was clarified and explained more thoroughly.

Information Systems graduates secure roles in organizations where they are known as liaisons between technology and business professionals since they have background in both areas. They must be able to adapt their message to their current audience. Directed paraphrasing requires the students to summarize and restate important material for a given audience, making it more challenging than simple paraphrasing (Angelo &

Cross, 1993). Directed paraphrasing provides feedback for moving forward as well as allowing students to be a resource for others in the class. In addition, the activity fulfilled concept and skill transfer as the students had to apply their knowledge in new situations.

The instructor created 11 directed paraphrasing tasks related to web colors and fonts, usability testing, and prototyping. The students worked in pairs to generate their response. One of the tasks was: "You are a systems analyst, and your current project is designing a new kiosk for a local car wash. Your manager has heard of wire framing and thinks you should start immediately with electronic designs. Your colleague wants to start with simple paper prototypes. What questions would you ask before determining whether you agree with your manager or colleague? Then share how you would explain to your manager that your colleague may be right, remembering she is your manager."

A second example was: "You are a web developer and just listened to a webinar about making web sites accessible for those with disabilities. You recommend that the company web site be updated for this reason. The vice president of your company does not think that many people with disabilities use the web site and thinks it's pretty good already. How do you respond to him? Support your argument with details."

The student pairs wrote their responses and all papers were collected. Then the instructor shared the scenarios and the response written. Students were able to hear feedback about all of the situations and suggestions were made on how to word ideas more carefully. Providing feedback to entire cohort at one time can be a benefit of formative feedback (Winstone & Millward, 2012).

4. INSTRUMENT

Students were invited to complete a survey at the end of the semester about the learning benefits and enjoyment of the activities. Sixteen students participated in the survey. The survey described each activity since it had been a while since some of the activities were done. Then students were asked to respond to these questions on a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree.

1. This activity was beneficial to my learning.
2. I enjoyed this activity.

There was also a question to rank order the activities and optional open-ended questions asking for positive and negative comments.

5. RESULTS

Table 1 shows the average score of each activity on the 5-point scale.

	Beneficial to Learning	Enjoyable
Key to class	4.50	4.31
Muddiest point	4.15	4.17
Test questions	3.92	3.92
Empty outline	4.23	4.00
Paraphrasing	4.07	4.08

Table 1: Average scores

The results of ranking the activities from most important to least important to keep in class are shown in Table 2.

Activity	Rank in importance
Key to class	1
Test questions	2
Empty outline	3
Muddiest point	4
Paraphrasing	5

Table 2: Ranking in importance

Five positive comments and one negative comment were included in the open-ended questions.

6. DISCUSSION OF RESULTS

Overall, students thought the activities were both beneficial to learning and enjoyable. A clear result was the key to class activity scored and ranked the highest. The students viewed this as a valued activity even though they did it outside of class time. I have used key to class in other classes as well and find that nearly all students will participate to have a "key" to get into class.

Directed paraphrasing ranked at the bottom of importance of keeping it in the class. This finding was surprising as it seemed the students were participating well when this activity was done. This activity was probably the most challenging as they had to determine an answer and then write it for a certain audience. Given the relevance of this skill, additional practice with directed paraphrasing is probably necessary.

Student-generated test questions had interesting results. It was ranked second in importance to keeping in class but least beneficial to learning and least enjoyable. The only negative comment on the survey was "student generated test questions" so it's clear that at least one student had strong negative feelings about this activity. Perhaps some students were uncomfortable in the role of writing questions or didn't think they should participate in a typical teacher process.

The positive comments included "I really liked the class activities. They helped me learn new things," "Key to class session is good", and "All activities are very good which helped us to understand more about the material." The students are generally unaware that they are participating in formative assessments; they view them as just part of the class.

While these activities and formative assessments were not graded, the material was included on summative assessments. For example, a directed paraphrasing essay question about mobile apps and web sites was included on the final exam. Seventy-seven percent of the students (N=22) earned an A (100 percent) on the question while 23 percent earned a B (83 percent). It was evident they recalled strategies from their practice and the class discussion that followed.

7. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The small sample size is definitely a limitation making it difficult to be confident the findings are applicable in other situations. The findings were based on student opinion of their learning, not based on their actual scores on summative evaluations.

Changes to be made in future studies would be to ask students about the activity right after it is completed or at a few set times in the semester instead of waiting until the end of the semester when recall could be an issue. Also requiring or asking for more qualitative feedback could give more insight into student views.

Future studies could use other formative assessment strategies. While Heinerichs et al. (2016) encourages educators to select 3-4 activities to use repeatedly in class, others including Lumpkin et al. (2015) urge teachers to try different activities and to adjust them to meet the needs of students. Both have valid points. If there is a lot of time spent on figuring out how an activity works, time is lost for learning the content and using only a few types of activities is probably better. Trying new ones could lead to better ways for students to learn material.

8. CONCLUSION

As teachers prepare for class each day, they should attempt to think of ways to make their students active participants. Resorting to lectures only does not provide students the chance to be challenged to think about the content (Heinerichs et al., 2016). Often the phrase "guide on the side" is used to describe this new role that a teacher may have when not lecturing the entire class period. This shift does not relieve the teacher of instructional effort or the responsibility of making sure that learning is occurring. Well-designed instructional environments are engaging to students but are also well regulated (Wiliam & Thompson, 2006).

Teachers can improve by integrating active learning activities, varying the approach to meet student needs, and assessing students and making adjustments as a result (Lumpkin et al., 2015). Incorporating these ideas could help teachers to deliver better teaching methods for increased student learning.

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The Urgency for Cybersecurity Education: The Impact of Early College Innovation in Hawaii Rural Communities

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Abstract

There is urgency for minority serving rural hybrid community colleges for innovation in offering cybersecurity education to local high school students who have no access to these emerging occupations. Focusing on high school women and minorities, this case study uses field experiences to drive an iterative improvement process that enhances the delivery of online pedagogical and learning design in a tri-island county. Beginning in Fall 2016, the project, implements an early college cybersecurity career pathway, targeting the low access of women and minorities at the high schools pursuing higher education cybersecurity programs by: enrolling 84 high school students in an online sequence of college cybersecurity courses over four semesters.

The intent of the case study is to determine how and why things work (including identifying the contextual constraints) within university-high school partnerships aimed at closing the skills gap for women and minorities for cybersecurity jobs while in high school. Our iterative effort has led us to explore deeper issues around innovation in online pedagogies while focusing on the underrepresentation in cybersecurity. This paper serves as an example of an exploratory researcher-practitioners and iterative design specifically within an early college context across educational sectors (e.g., high school and college). The study promotes a better understanding of how to embrace discovery to provide all high school students access to advanced technology educational opportunities like cybersecurity.

Keywords: cybersecurity education, educational innovation, early college, university-high school collaboration, convergence of K-12 and higher education

1. INTRODUCTION

Vital Signs Hawaii (2017) reports that business leaders in Hawaii cannot find the science, technology, engineering and mathematics (STEM) talent they need to stay competitive. STEM fields are growing in Hawaii and is predicted that between 2017 and 2027: STEM jobs will grow 8% and Non-STEM jobs will grow 4%. The Hawaii STEM skills shortage starts early. Students' lagging performance in K-12 is a critical reason why.

Cybersecurity Ventures report estimates that there will be 3.5 million unfilled cybersecurity jobs by 2021 which is significantly higher than the 2016 estimates of 2.5 million. According to CyberSeek (2017), which is a project supported by the National Initiative for Cybersecurity Education (NICE), as of September 2017, there

are 350,000 current cybersecurity openings in the U.S. which is up from the 2015 data of 209,000 job openings. This indicates that there is an increasing shortage throughout the United States.

Hawaii must close the gaps in the STEM pipeline. The Hawaii STEM pipeline loses young people at every level of the education system. Low graduation rates from college narrow the pipeline of students who can gain advanced STEM skills. In 2014-2015, approximately 82% of students graduated from high school in Hawaii compared to 83% in the continental US. Of the Hawaii 2012-13 high school graduates approximately 47% graduated with a 4-year degree program compared to 60% in the continental US. Additionally, approximately 18% of the 2012-2013 high school graduated with a 2-year associate's degree compared to 28% in the continental US. Finally, of the Hawaii 2014-15 graduates, approximately 20% were certificates and degrees in the STEM field compared to 26% in the continental US.

Together, females and minorities make up more than half of Hawaii's population, yet they are much less like to earn STEM degrees or become STEM professionals. Closing these gaps can pay big dividends in Hawaii. Low-income and minority children lag behind in Hawaii.

In Hawaii, these gaps limit individual opportunity and economic growth. Yet not enough students get the chance to learn rich and challenging content that prepares them for college and careers. Lack of access to better STEM learning opportunities severely limits young people's college and career prospects.

The community college connection to high schools is widely increasing via a number of models that offers early college options (Morest, V. S. and Karp, M. M., 2006; Bragg, D., 2013). In addition, community colleges are central to focusing on this new wave of America's high school women and minorities in these initiatives to improve their labor market prospects (Osterman, P., 2012).

The University of Hawaii Maui College (UHMC) is a rural hybrid community college that offers Bachelors of Applied Science Degrees. UHMC addresses the needs of a diverse student population of approximately 4,200 students in a three-island community with its main campus located on the main island. The two other islands have an estimated population of 154,834 (as of the 2010 U.S. Census). Over 10 percent of the constituent population consists of Native Hawaiian and other Pacific Islanders. The percentage of Native Hawaiian and other Pacific Islanders is much higher in the more remote locations, 26% and 29%, respectively (County Data Book, 2012). High schools in Maui County lack access to basic technological services and certified technically trained teachers to increase the number of women and minority graduates prepared for careers as cybersecurity technicians.

Chai, Bagchi-Sen, Goel, Rao and Upadhyahya (2006) claim that underrepresentation of minority workforce in the IT industry is one of the reasons for the scarcity of skilled labors in the information security industry. Funded by the National Science Foundation Scholarship for Service National Science Foundation (NSF) Scholarship for Service (SFS) [Award #1516178 (10/15/2015-09/30/2018)] and National Science Foundation Grant [Award #1515256 (9/1/2015-8/31/2018]. This study is designed to increase the number of minorities and women succeeding in college level cybersecurity education and degree programs by offering a Cybersecurity Certificate of Competence as highlighted in Appendix 1.

2. EARLY COLLEGE PROJECT OVERVIEW

Developing Career and Technical Education (CTE) cybersecurity career pathway for high school students is at its infancy in many rural communities. There is a shortage of teachers at the high school who can support their students in being successful in rigorous, academic cybersecurity courses.

This early college project aims to fill this urgency by: (1) offering an online sequence of four cybersecurity college courses to high school students, one every semester, taught by college faculty; (2) orchestrating collaborative recruitment strategies to attract minorities and young women into the field; and (3) embracing a learning-by-doing approach that employs multiple quick tests of change, student and stakeholders surveys, an iterative refinement process to support women and minority high school college students. The university-high school partnership involves the following high schools in Maui County: Maui High School, Lahainaluna High School, King Kekaulike High School and Kamehameha High School-Maui Campus.

This project offers high school students financial stipends to enroll in a sequence of four college cybersecurity courses and receive a Cybersecurity Certificate of Competence. (See

Appendix 1 for course listing and descriptions.) The stipend is used for payment of tuition, fees and course textbooks.

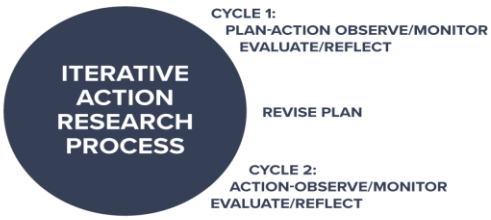
Case Study Design and Implementation

Early college access is complex with multiple causal and mediating factors that govern access for different groups and individuals. Sargut and Mcgrath (2011) state there are three properties that determine the complexity of an environment: (1) *multiplicity* refers to the number of potentially interacting elements; (2) *interdependence*, relates to how connected those elements are; and (3) *diversity*, has to do with the degree of heterogeneity.

This project views the Early College cybersecurity career pathway access and participation as an organic complex system that contains a large number of interactive, interdependent, diverse elements; moreover, the greater the multiplicity, interdependence, and diversity, the greater the complexity. Its essential features may operate in patterned ways, but their interactions continually change.

Thus, the study uses an iterative action research process for continuous innovation in its onboarding (e.g., access) strategies, support services, and teaching pedagogies and learning management systems (See Figure 1) toward course completion.

Figure 1: Iterative Action Research Process



This study aligns with Bryk, Gomez, Grunow and LeMahieu (2016) improvement science theoretical underpinnings. The project also presents a researcher-practitioners and development improvement science design to facilitate learning and innovation throughout the project. The iterative process identifies what the complexities (e.g., multiplicity, interdependence, diversity) and challenges in early college might be, and tracks the impacts on learning, motivation, and other desirable outcomes.

Specifically, one of the major strong points of the program iterative research process is that the project continually evaluated the program to examine its strengths and to also find ways to improve. Some of the program strengths are that it has support from high school counselors and an experienced online teaching staff.

One weakness that became evident during interaction with Cohort One was that the students were having difficulty with time on task. Recognizing this was an urgent issue, the Project Recruiter/Retention Coordinator, along with a student mentor were added to the team. According to others on the team, the Project Recruiter/Retention Coordinator "did an excellent job tracking students" and "his role was crucial".

Other hurdles for Cohort One concerned technology. There were multiple firewalls that the students had to pass through while logging on from their high school campus. Additionally, students are required to learn how to navigate the UHMC online platform the Laulima Learning Management System (LMS).

For underrepresented high school students, the additional support provided by the Project Recruiter/Retention Coordinator is extremely important. The Project Recruiter/Retention Coordinator along with high school teachers/counselors and the UHMC student mentors team with the course instructor to support the students' learning via the LMS platform. For many of these underrepresented students, the only feasible way to offer these cybersecurity classes is online. Yet, online classes create additional barriers for these same underrepresented students such as navigating the technology and lack of time management skills. This coordinated team approach helps all students deal with ongoing technology and course issues to keep them on task.

Another example is the first cohort had more Filipinos than Native Hawaiians/Polynesians. In order to increase the number of Native Hawaiians/Polynesians, the project recruited from the Arts and Communications pathway. This was both innovative and essential to success of diversifying the program since this pathway had a higher concentration of Native Hawaiians/Polynesians. Recruiting from the Arts and Communication pathway also increased the number of female students in the program since females are more heavily concentrated in the Arts and Communication pathway.

In addition, the project used their social network to recruit at an Open House through a senior high school counselor. Parents also attended this Open House at two private schools with a high concentration of Native Hawaiians. The combination of these two changes led to a major increase in the number of Native Hawaiians/Polynesians in Cohort Two.

Another change from the first cohort to the second was to recruit students earlier in their academic career. By the time that students are seniors it is challenging to change their college and career aspirations.

The project also discovered practical issues concerning Early Admit programs. The project learned that there were some misunderstandings about how Early Admit programs work. For example, the Principal Investigators thought that they would initiate enrollment in the Early Admit program. In reality, since the students are under 18, high school principals initiate the enrollment into the program. This makes the relationship between the high school principals and the project Principal Investigators even more crucial for success of the project.

Admissions processes at universities and community colleges need to be reviewed to make sure that they do not unreasonably provide obstacles for Early Admit students taking online classes. For example, the normal Health Clearance is not necessary for online Early Admit students and can create an unnecessary, prohibitive burden for these students. Overall, it was important for all the constituents from high school teachers, high school principals, high school counselors, project Principal Investigators/staff, college teachers and college administrators to develop an effective professional relationship and willingness to revise or allow exceptions to existing policies when necessary for the project to be successful.

3. ANALYSIS – FIRST YEAR EVALUATION

Demographics of Cohort One and Cohort Two

The First Cohort of students in Spring 2016 contained 41 students and in Summer 2016 Cohort Two consisted of 43 new students. Thus, during Year One of the grant 84 students have already participated in the project. This surpasses the expectation for the entire two years of the grant. For both cohorts, females outnumbered males.

An innovative strategy to reach Native Hawaiians/Part-Hawaiians was also used by this project. In addition to traditional STEM recruitment, they recruited students from the Arts and Communication pathway. This project has a higher concentration of Native Hawaiians/Part-Hawaiians and served as a successful, innovative way to recruit students into cybersecurity. Thus, from Cohort One and Cohort Two the percentage of Native Hawaiians/Part-Hawaiians increased from 7% to 19%.

From Cohort Two, the project was able to collect additional, valuable survey data. Thirty students completed the survey. From this survey, we were able to discern what excited them about being an Early Admit Student.

Students were allowed to select more than one option from a checklist that also allowed them to select *Other* and to fill in an open-ended answer. The most popular answer was *New Classes* with 86.67% of the students selecting this option. The second most popular response was *Friends Enrolling* with 43.33% selecting this option. *New Teachers and Other* tied for third most popular response with 16.67% selecting each of these options.

When asked to rank order their plans for after graduation, it was evident that most planned on attending college. Neither work nor the military was any of the students' first choice. Work was the second choice for 6.67% of the students. The number one choice for the majority of the students (58.62%) was to study on the Mainland US or abroad. The second most popular choice was study in the Pacific, which was selected as the number one choice by 23.33% of the students. University of Hawaii Maui College being selected as the number one choice by 20.69% of the students followed this.

Students were asked to rank order the following items as to what would increase their interest in Cybersecurity: (1) more information about what the job might entail, (2) access to more relevant classes to see if I would be good at it, (3) reassurance that I would earn a good living, (4) opportunity to speak to current professionals about the pros and cons, (5) if my friends thought it would be a cool career, (6) if my parents thought it would be a good career, and (7) nothing.

The choice that was ranked number one the most frequently was more information about what the job might entail. This option was selected first by 36.67% of the participants.

The second most frequently selected response was access to more relevant classes to see if the student would be good at it. This option was selected first by 33.33% of the participants.

The third most frequent response was reassurance that I would earn a good living. No participant selected either my friends thought it was a cool career or my parents thought it was a good career as his or her number one choice.

For the second most important reason, access to more relevant classes to see if I would be good at it was the most frequently selected response at 36.67% followed by more information about what the job might entail at 33.33% and opportunity to speak to current professionals about the pros and cons at 20.69%.

For the open-ended response, the most frequent response provided by students was that a teacher recommended that they take the course. This was the response provided by 35.7% of the students. When combined with counselor recommendation when reported by 7.1% of the students, we have a clear indication that one of the successes of the project, is based upon the relationships that have been built with teachers and counselors at the schools.

The next most common response was that they would receive college credit. This indicates that the students do plan on going to college and are very interested in their future. Another important finding was that 21.4% of the students took the course because it is free. Cost is going to be a major factor for underrepresented students and it is important to find ways for them to be able to have an affordable route to careers in fields like cybersecurity. Another 17.9% of the students took the course because friends recommended it. The success of students in Cohort One influenced students in Cohort Two.

Cohort Two was asked in two different ways why they took the class. First they were asked whether they agreed with certain statements as to why they took the class. Secondly, they were able to write in an open-ended answer as to why they took the class.

When asked if they agreed with the statement, "I took this class to see what Cybersecurity is all about," 82.1% either agreed or strongly agreed. For the statement, "I took this course to see where Cybersecurity is applicable," 71.4% either agreed or strongly agreed. The lowest agreement was with "I took this course to understand the Cybersecurity issues in business" with half of the students either agreeing or strongly agreeing.

4. ANALYSIS – SECOND YEAR EVALUATION

Cybersecurity Early Admit Cohort One Withdrawal Report

A total of nine students withdrew from Cohort One. In consultation with project PIs, the project evaluator developed a survey to understand why students withdrew from the courses and to see what if any impact the courses had upon students who withdrew. The survey for students withdrawing had a 100% response rate.

Of the students who withdrew, 77.78% were female and 22.22% were male. There are slightly more females in this cohort than in the number who successfully completed the project (68%). The majority of students withdrawing were Filipino with 66.67% of the withdrawing students. In addition, 11.11% were Japanese, 11.11% were White, and 11.11% were multiple ethnicities. Again, Filipinos were slightly higher in the withdrawal cohort at (66.67%) compared to 59% successfully completing the project. In both of these cases, the small sample of those withdrawing means that the difference of one student can make a larger difference in the percentages.

One of the most surprising answers was to the question, "What grade did you expect in the class if you did not withdraw?" Over half (55.56%) said that they expected an A, 22.22% expected a B, 11.11% expected a C, and 11.11% expected a D. None of the students expected to receive an F in the course.

Prior to taking the course, 33.33% reported no experience with programming, 44.44% reported beginning level, and 22.22% reported intermediate level. None reported advanced level of programming. Similarly, 22.22% reported no prior knowledge of cybersecurity, 22.22% reported slight prior knowledge, and 55.56% reported moderate prior knowledge of cybersecurity. None reported that they were somewhat or very knowledgeable about cybersecurity before the course. Prior to the class, 22.22% reported no interest in cybersecurity, 22.22% reported a slight interest in cybersecurity, 11.11% reported a moderate level of interest in cybersecurity, 33.33% reported they were somewhat interested in cybersecurity, and 11.11% reported they were very interested in cybersecurity.

Students who withdrew from the course, overwhelmingly reported being more aware of

career opportunities in cybersecurity (88.89%) and more knowledgeable about what is involved in cyber careers (87.55%). Over half (55.56%) reported that they are interested in taking courses in cyber security in the future. All reported that they plan on attending college.

When asked an open-ended question about why they withdrew from the class, 77.78% reported issues related to time. These included their lack of time management and/or too many activities. One of the other two students reported that they dropped the class because it was not related to their career interests and the other reported that they would not have dropped the class if they had known that there was going to be an additional class. When asked what would have helped them be more successful in the class, again many of the answers related to time management. For example, one student suggested that there should be due dates throughout the course. A couple of students did express communication concerns such as better prompts and better communication between the students and teacher. Overall, even with the students who withdrew from the project, the course had a positive impact with students gaining insight into careers in cybersecurity.

Cybersecurity Early Admit Cohort Two-Withdrawal Report

A special survey was administered to the students who had withdrawn from the Early Admit Project Cohort Two to ascertain how to improve the project. Sixteen students completed this survey. Of the students who withdrew from the project, 81% were female and 19% were male. The majority of the students who withdrew from the project was either Filipino or classified themselves as multiple ethnicities. It is important to note that none of the white students withdrew from the project.

Similar to the finding from the withdrawals from Cohort One, the majority of students who withdrew from Cohort Two expected to receive a good grade from the class with 53% of the students reported that they expected to receive a 4.0 in the project and another 33% reported that they expected to receive a 3.1-3.9 in the project. None of the students expected to receive a 0 to 1.0 in the project.

The majority of the students who withdrew from the course reported that they had either no programming experience (37%) or were a beginner (50%) while 13% reported that they had intermediate level experience and none reported that they were advanced in programming. Similarly, most reported limited knowledge of cybersecurity before the project with 38% reporting no knowledge of cybersecurity and 44% reporting slight knowledge of cybersecurity, 6% reporting moderate knowledge, 12% somewhat knowledgeable of none reporting that they were vey knowledgeable about cybersecurity prior to the course.

Half of the students who withdrew were very interested or somewhat interested in cybersecurity before the course. The students who withdrew from the project overwhelmingly reported that the project had made an impact on them. All of the students reported that from participating in this project that they were more aware of career opportunities in cybersecurity and 88% reported that they were interested in future classes in cybersecurity. All of the students were reported that they intended to attend college.

When students were asked an opened ended question about why they withdrew or dropped the class, the most common response from 73% of the students related to competing activities, competing classes such as AP classes, or time management. One student reported that there was miscommunication with their school so that they did not know whether they were in the course or not and another student reported computer compatibility issues.

When asked an open ended question in regard to what would help them be more successful, over half of the students (53%) responded with responses related to time management or having more time. The second most frequent response was more or better communication with the teacher. This was the response of one third of the respondents. One respondent said that easier assess would be helpful and one respondent said they would have been more successful if they were more interested.

Y5. YEAR 2 PROJECT RESULTS – LEARNING MANAGEMENT SYSTEM

Description of LMS

Higher education institutions have strived to improve instructional techniques and methodologies to enhance the learning experience for students. By offering distance learning/online classes higher education has made learning accessible to larger student populations (Chawdhry, et.al. 2011). As of Fall 2014, approximately 5.8 million students enroll in at least one online course according to a study by

Babson Survey Research Group and the Online Learning Consortium (2015).

Early college students at the University of Hawaii Maui College, currently use the Learning Management System (LMS) Sakai that was originated from within higher education to address the needs of the academic environment. Sakai provides tools to assist with delivering online classes comparable to those offered in traditional on-ground classes. Institutions can customize the features of Sakai to best fit the needs of their students and curriculum. Core tools that assist with the online delivery include discussion capabilities, announcements, messaging and email, dropbox, gradebook, and group features for chat and collaborating on projects (Sakai, 2017).

In addition to using Sakai, early college students use TestOut as a supplement to the LMS. TestOut is an outside LMS that provides online labs for academic institutions. Students are able to have hands-on experience to labs in a simulated environment of LabSim (TestOut, 2017). Universities are often faced with lack of resources especially when it comes to building computer labs that meet the changing needs of information technology. By using LabSim, students watch videos dealing with the class being studied such as Introduction to Security and Introduction to Networking where they can learn the techniques and skills used in the field. After watching the videos, students are required to complete labs based upon the lessons learned in the virtual environment. Students are given virtual computers and networks to practice their skills.

Although TestOut provides a way for students to have hands-on experience in a virtual environment, it still has a downside. Ethics in regard to cheating is an area of concern. The digital landscape has caused a paradigm shift of protocols when it comes to test taking, or in the realm of TestOut, virtual labs (Douglas, et.al 2015). Academic institutions all over the world are using TestOut. With that being said, it should not be a surprise to find out that there are YouTube videos on almost every lab in TestOut.

Students can follow along with the YouTube videos while working on the virtual labs and have all of the answers within minutes. Additionally, due to the nature of how TestOut is set up by a second party provider, students can easily get the answers within the interactive demos by merely starting the demo and clicking "done" in the right hand corner of TestOut. By clicking "done" TestOut shows step-by-step every answer to the lab. Students can then take screenshots or pictures with their mobile devices that can then be used to answer the questions when they start the lab again. The need for ethics in distance learning education is critical to a student's success that is why it is important to invest in tools that minimize student cheating.

An improvement to students using both Sakai and TestOut would be to follow the standards set by Accreditation Board for Engineering and Technology (ABET) which is the accrediting body for engineer and technology degrees. ABET standards require group projects that simulate real-world experience in both on-ground and online courses in information technology. Students should still use TestOut to gain an understanding of how the technology works but the labs should be weighted at a lower percentage to the points that can be earned in the class, allowing the majority of points to be awarded to group projects where students must demonstrate the understanding of the tools, concepts and lessons.

Student Feedback on the LMS

The University of Hawaii Maui College (UHMC) Early Admit Project funded by an extramural grant overall has been a very successful project. However, one of the obstacles for the successful implementation of the project has been the issue related to the Learning Management System used. The high school students found it difficult to access the project. In addition, there were compatibility issues between Test Out and Laulima, the Learning Management System used by UP. This created additional issues for the students and potentially may have increased the number of student withdrawals. Students from the first two cohorts who withdrew from the project were administered a survey. This allowed the project to identify problems to address for improvement. From both cohorts the number one reason that students withdrew was related to time management issues (such as balancing AP classes, extracurricular activities, or simply procrastination). However, another issue students addressed as a reason for their withdrawing from the project was related to the Learning Management System.

From the first cohort of students who withdrew from the class one reported, "The way we did the work was time consuming because it would load slowly at times". Another student from this Cohort commented on the vague prompts from the system. Two students felt that there should have been more due dates throughout the course.

The second cohort of students who withdrew from the class reported similar issues. When students who withdrew from the class were asked why they withdrew, the majority of the students responded with issues related to time management. However, one student reported that they were confused as to whether they were enrolled in the class and another student reported compatibility issues with the Learning Management System. Another student reported, "Maybe the project could explain more and sometimes it was slightly confusing". An additional student stated that they would have been more successful in the class if, "More time and an easy way to get in the files". A student reported that their computer was not compatible with the system.

Even students who successfully completed the class reported that there were compatibility issues with the system and their computers. One student said that no matter what they did, "some keys just didn't work no matter what I tried".

Advisory Board - Student Support and CyberPatriots

At the end of first year, a recommendation of the Advisory Board was to make sure that there is not a misunderstanding on how students are recruited into the project or the definition of the purpose of the Cybersecurity Early Admit project. Currently, no high schools give credit for the courses.

Additionally, Board members said that students should be encouraged to participate in cybersecurity competitions. They also said that it was very important that help, such as that provided by the Coordinator and Recruiter, and peer mentoring (UP undergraduate student) increase as students enter into networking classes. It was suggested that the project look at ways to expand to middle schools.

One point that was brought up at the Advisory Board meeting was that there is often a six-year break between when minorities graduate high school and when they enter the UP Cybersecurity Project. This grant may provide important insights into strategies to close this gap. Overall the Advisory Board was unanimously impressed with the project and the project's outreach.

During Second Year, the project entered five (5) teams in the National CyberPatriots Competition. Two teams made it to Round 2 Regionals Gold Division CyberPatriots Competition. One of the teams won second place in the Regionals. CyberPatriots Cyber camps have also been scheduled for this summer targeting middle school students by statewide coordinators.

Early Admit Stakeholders Survey

Thirteen stakeholders in the University of Hawaii Maui College (UHMC) Early Admit Project were surveyed about their experience and the experience of their students with the project. These stakeholders worked with the project in various capacities. They included high school teachers, high school counselors, mentor for schools (business/industry), grant recruiter and ICS instructor for UP.

These stakeholders had various levels of prior knowledge about cybersecurity before participating in this project. With the most frequent responses being very knowledgeable or moderate level of knowledge with approximately 31% of respondents selecting each of these options. Most participants were either very interested (42%) or somewhat interested (33%) in cybersecurity before the project commenced.

Overall, the Stakeholders reported that the project has been a success. Of the stakeholders 92% reported that from participating in this project, they were more aware of career opportunities in cyber security. Similarly, 92% reported that from participating in this project, they were more interested in helping students enter a career in a cyber security field. Of the participants, 82% reported that they were more prepared to help students take cyber security classes in the future. Likewise, 83% felt that this opportunity would help their students be more successful in the future; that they feel more confident in their students taking college classes in the future, and that they were interested in learning more about cyber security. An overwhelming 92% of the participants felt that they were more knowledgeable about cyber security careers. Most importantly, 92% agreed that they planned on recommending the Early Admit Project to their students. It is important to note here that the one person who disagreed with this statement was a college teacher so therefore the Early Admit project would not be relevant for their students.

The Stakeholders made the following recommendations to improve the project. When asked an open-ended question in regard to what could be done to improve the project, 38% of the participants responded that the project should be expanded. Similarly, 38% of the respondents want more focus on the relationship building for the students. For one participant that meant to build relationships with mentors for the students

while for another it meant to have an onsite meeting with the students at the beginning of the project. One quarter of the participants wanted additional services and materials such as licenses for Windows Server. Similarly, one quarter 25% felt that the participants were high school students and that therefore they may need special consideration. Overall, the Stakeholders were extremely positive about the value of the project and its contribution.

6. SUMMARY AND LIMITATIONS

One of the biggest challenges for the high school students was time management. A major obstacle in the transition from high school to college is the change from a teacher-directed to a student-directed environment; rarely does a college instructor monitor students' progress (Dembo and Seli, 2013). In college, students are expected to manage their own learning (Bembenutty, 2011). Additionally, high school teachers spend considerable time attempting to motivate students to learn, whereas college instructors generally expect students to be self-motivated. An online course format intensifies the culture shock and difficulties for high school students' first early college experience.

Another important functioning set of skills in early college online course dynamics to overcome its contextual constraints are: (1) learning how to navigate the learning management system, and (2) sending and receiving messages effectively between students and faculty. Help seeking is essential prerequisites among online learning strategies because students may feel that it implies they are incapable of completing the academic tasks without assistance, which can be threatening to self-worth. As a result, many college students fail to seek needed help, considering it embarrassing, an admission of defeat, and something to be avoided whenever possible (Karabenick & Dembo, 2011).

We are learning how to innovate promising cybersecurity educational pedagogies and support methodologies for early college high school students via an informative iterative process. Our iterative process has led us to explore deeper issues in innovation and the essential role of stakeholders across educational sectors.

Since the data features continually evolve via recent changes over 12 weeks, further feedback and reflection should be done to refine its improvements. Transferability refers to the extent that these findings can be applied to other populations, contexts, or individuals (Lincoln & Guba, 1985). A number of factors impact the application of these results to other groups, demographics and sample size. It is entirely possible that the results would be different if the research were conducted in another city or state, or if the research utilized a cross sample of locations within the United States. Sample size is another limitation of this study. Because of the resources and time, the number of participants was limited. Thus, consideration should be used when applying these results to studies of other cybersecurity early college project overall.

7. FUTURE IMPLICATIONS

The development of a reliable Career and Technical Education (CTE) early college online cybersecurity career pathway for high school students in rural communities is both desirable and in today's workforce development environment, urgent. Unfortunately, most cybersecurity educational recruitment, retention and persistence efforts in rural communities so far operates within the traditional and non-traditional college student profiles who have graduated from high school as opposed to applying and taking advantage of the new early college enrollment trend to include the high school continuum with a focus on minorities and young women. There is a new tidal wave of minorities and young women in rural communities who are interested and be successful in cybersecurity education if given the opportunity to enroll while in high school

Next steps in this project include expanding this researcher-practitioners and development model to neighboring islands, examining parallels between the online learning and teaching pedagogies, support service methodologies, and environmental factors among different school-community contexts.

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Appendix 1 – Course Description of Cybersecurity College Courses

ICS 101 - Digital Tools for the Information World - Emphasizes production of professional level documents, spreadsheets, presentations, databases, and web pages for problem solving. Includes concepts, terminology, and a contemporary operation system.

ICS 169 - Introduction to Information Security - *Prereq: ICS 101 with grade C or better, or consent.* Provides the basic foundation to information security, including identifying threats, planning for business continuity, and preparing for various security attacks. Focus will be given to threats to financial security such as attacks on banking and other related financial information. Special emphasis on ethics and legal issues that covers hacking and other cybersecurity techniques and tactics.

ICS 184 - Introduction to Networking - *Prereq: ICS 101 with grade C or better, or consent.* Provides the student with the knowledge and skills to manage, maintain, troubleshoot, install, operate and configure basic network infrastructure, as well as to describe networking technologies, basic design principles, and adhere to wiring standards and use testing tools.

ICS 171 - Introduction to Computer Security - *Prereq: ICS 101 or consent.* Examines the essentials of computer security, including risk management, the use of encryption, activity monitoring, intrusion detection; and the creation and implementation of security policies and procedures to aid in security administration.

Highly Recommendation Course: ICS 110 - Introduction to Computer Programming - *Prereq: ICS 101 with grade C or better, or consent.* Teaches fundamental programming concepts including sequential, selection, and repetition flow; variables and types; syntax; error types; compilation; linking; loading; and debugging. Introductions algorithms flow charts, UMI, and other analytic tools. Explains and practices problem solving and critical thinking methods.

International Service Learning in IS Programs: The Next Phase – An Implementation Experience

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Abstract

Information systems programs have offered students opportunities for service learning in their curriculum through elective courses and through capstone courses. However, even though there have been numerous research studies showing the benefits of international service learning experiences, information systems programs have not yet developed these in their curriculum on a large scale. This paper provides an account of an implementation of an international service learning experience through an information systems project management course. Students worked with a middle school in Guatemala to successfully deliver a sustainable website. The course is described using a modified service learning framework. The framework consists of preparation, action, reflection, evaluation, and share. The paper also provides challenges and lessons learned. This modified framework and challenges and lessons learned can be used by other programs to structure their own international service learning experience.

Keywords: Service learning, international experience, project management, Information Systems Curriculum

1. INTRODUCTION

The benefit of service learning (SL) has been the topic of many journal articles (Bowman, Brandenberger, Mick, & Smedley, 2010; Geleta & Gilliam, 2003; Moely & Ilustre, 2014). The information systems (I.S.) discipline area has not failed to take part in providing its students with opportunities to engage in SL through courses across the curriculum (Hoxmeier & Lenk, 2003; Preiser-Houy & Navarrete, 2006; Wei, Siow, & Burley, 2007). The benefits of engaging in international service learning (ISL) have also been a topic of much research. There has even been discussion of differences between domestic and ISL (Niehaus & Crain, 2013). The I.S. discipline has not produced many articles in the area of ISL experiences. However, just as students have been given opportunities in the domestic setting for SL in I.S. curriculum, I.S. programs should try to incorporate ISL opportunities as well.

The purpose of this paper is to share the implementation experience and lessons learned in incorporating an ISL project into an I.S. project management (PM) course. The project conducted during the semester was a website for a middle school in Guatemala, the Pavarotti Center. Students worked with the school to successfully deliver a sustainable website.

Benefits of Service Learning

SL has been defined as a "course-based credit-bearing educational experience in which students

participate in an organized service activity that meets identified community needs and reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility" (Bringle & Hatcher, 1999, p. 180). Geleta and Gilliam (2003) and Mumford and Kane (2006) describe SL as an experiential pedagogical approach that goes beyond mere classroom instruction. SL involves the blending of service activities and classroom instruction with the purpose of meeting real community needs as students learn through active engagement and reflection.

Numerous researchers have found a positive effect of SL on learning outcomes. SL was found to improve leadership development (Friedman, 1996) and communication skills (McCarthy & Tucker, 1999; Tucker, McCarthy, Hoxmeier, & Lenk, 1998) as well as social responsibility (Kolenko, Porter, Wheatley, & Colby, 1996). Prentice and Garcia (2000) found that SL fosters civic responsibility, personal and social development, and opportunities for career exploration.

Hoxmeier and Lenk (2003) found that I.S. students participating in SL courses gain not only the course related technical knowledge, but also improved interpersonal skills and an understanding of the value of their information systems knowledge to the community they served.

A number of studies have shown the benefits of an ISL experience. Keily (2004) interviewed students who participated in ISL programs in Nicaragua. He identified changes in students' worldviews along six dimensions: political, moral, intellectual, cultural, personal and spiritual.

Tonkin (2004) looked at the long-term effect of ISL programs on students. Tonkin found that compared to students in traditional abroad programs those who had participated in ISL demonstrated deeper intellectual and moral changes, and showed a greater demonstration of leadership qualities.

Niehaus and Crain (2013) examined the differences between completing a SL project domestically vs internationally. They found significant and meaningful differences when comparing the two programs. They found that students on international trips reported higher levels of interaction and engagement with community members. Students on international trips also reported learning more from both community member and host site staff.

2. OVERVIEW OF THE ISL COURSE

In the fall semester, students were engaged in the classroom with lectures and activities geared towards learning PM concepts and tools. Students were connected with the Pavarotti Center to gather information on the project. They also learned about the culture and history of Guatemala.

Students used PM tools to prepare and execute the project. In this case, the project was completed prior to arriving in Guatemala. Once in Guatemala, the students delivered, trained and handed off the project. Students then closed the project at the end of the trip and completed reflection pieces.

There were three integral parts to the course: PM, SL and an intercultural experience in Guatemala. The three parts were brought together with the website project (Figure 1). Throughout the fall semester, the students had lessons in one or more of these three parts each time the course met. It was important they learn all of the PM skills and abilities expected after taking a course in PM. It was also important that they truly understood what SL was and how to properly go about working in a community in a way that promotes sustainability and reciprocity. Lastly, it was equally important that they understood the culture and history of Guatemala and who their client was in order to properly engage with them, build a relationship, and ultimately deliver a product that met their needs in a sustainable way.

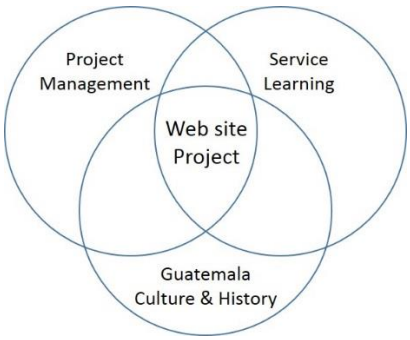

Figure 1. ISL Course

3. COURSE IMPLEMENTATION

The structure of the course can be framed using a modified P.A.R.E. Model (Figure 2). The

P.A.R.E. model of SL is a widely recognized practice in SL, originally developed by the University of Maryland (2015). The P.A.R.E model is a structured approach for SL experiences, which includes the key components of preparation, action, reflection, and evaluation. These four steps are described in Appendix 1. We modified the model to have the reflection being conducted throughout the SL experience as depicted in Figure 1. We have also included the final component: share.

Figure 2. Modified PARE Model

Share is a component we added to make the experience complete. Reflection allows students to reflect on the experience with others who were a part of the same experience. Share will allow them to reflect with those who were not a part of that experience. This may include students interested in getting involved in this type of experience or exchanging experiences with those who have been on different SL experiences.

Preparation

The course was structured to be taught on campus in the fall and then the students would complete their travel component in January. The first step was to determine which community would be selected. The Pavarotti Center is an initiative of the Rigoberta Menchu Tum Foundation, which is an institute that advocates for human rights, especially those of indigenous people.

The school was selected because the university had a prior and ongoing service relationship with the school. This was discovered by communicating with the university's Department of Cultural and Global Engagement (DCGE). The preliminary work was done by traveling to Guatemala on an earlier student trip through DCGE where the professor met with the director of the Pavarotti Center and the technology teacher in regards to potential and most needed projects. It was determined that an informative website was at the top of their list. There were certain constraints and requirements regarding the website, but all were reasonable and obtainable; namely, the site needed to provide information regarding the Pavarotti Center and its intercultural tourism opportunities, it needed to be sustainable – both manageably and financially, and they wanted the domain name to be their own name with a Guatemala country code.

Information sessions were held about the course during the spring semester several weeks before students registered for fall semester courses. During this time, students were provided information regarding course objectives and broad expectations. Students were given an opportunity to apply for the course and once selected were given the deposit due dates.

Once the roster was set, students, the professor and the DCGE director met to get acquainted and go over a few logistical items, such as travel, dates, passport issues, vaccinations, etc., prior to summer break. At this meeting, students were asked questions about why they wanted to be a part of the class and what expectations they had of the course, SL, and traveling. This also gave an opportunity for students to ask any questions they had before heading home.

Two students were selected to be student leaders. They were not, however, project managers. This allowed all the students to have the opportunity to experience working in all aspects of PM. The student leaders would be the point of contact for the students and for the DCGE office. The student leaders ensured that all students were informed of any logistical information regarding the travel portion of the course. They would also ensure that everyone had all necessary documents for the trip. In addition, the student leaders would be responsible for leading the students in reflections while in Guatemala.

Over the course of the summer, the professor communicated with the DCGE director. She helped to identify the appropriate articles and videos to assign the students throughout the semester. The DCGE office handled all the travel logistics and the itinerary for the trip. Although, we had one native Spanish speaking student, we also hired a translator.

The first day of the class began with a discussion on the students' motivations for taking this ISL PM course. After watching a video on voluntourism, the DCGE director led the students in a discussion of what the goals and objectives of SL are. It was important that we removed the "savior complex" right from the beginning of the semester and put the proper understanding of what this SL course would be: to build a relationship with the Pavarotti Center in Guatemala and help them with a sustainable project.

The next step was to educate the students on Guatemala. They were required to read several articles and watch videos on the history and

culture. We would then discuss these during our sessions together. These were extremely important for two reasons. First, it was important to prepare the students prior to going to Guatemala. They needed to understand the history and culture before engaging with people there. These trips are about partnerships, building relationships and learning from each other. Our students needed to do their part and be prepared before meeting with the students of the Pavarotti Center. The second reason was they were building a website for a client. In order to do this properly, they needed to understand their client to the best of their ability. Cultural differences can hugely impact how you would develop a website.

A few weeks before leaving for Guatemala, the students met with the DCGE director for additional cultural sessions and more specific information on the relationship of the university and the Pavarotti Center. The DCGE office also provided a basic Spanish speaking session for the students.

Action

Students had required readings in an IT PM textbook. For most sessions during the first nine weeks of the semester, PM concepts were introduced. They were quizzed on the material. Students were also introduced to Microsoft Project. They had individual assignments in Microsoft Project to familiarize themselves with the capabilities of the software. After the concepts were learned, they were applied to the website project.

Communication with the technology teacher at the Pavarotti Center was done indirectly through the DCGE director. Questions were submitted to the director who would forward them to the technology teacher. The students sent a letter asking questions regarding the website requirements. Our native Spanish speaking student would translate the letters. Once the students received the requirements from the technology teacher, they had their kickoff meeting and developed the project charter. From there, the scope and work breakdown structure were developed. The students learned about both traditional and agile methodologies in the course. For this project, they followed a traditional approach.

Adding Scrum Meetings

Time was very tight to complete all of the objectives. It was important to know what work was completed, in progress, and what challenges were found. So though the students followed a traditional method for the project, the students began each session with a 15-minute scrum meeting.

The scrum meetings would begin at the start of class whether everyone was there or not. The class would stand in a circle at the front of the room. Each person answered the three questions: what did you complete since our last session; what are you working on today; and what challenges are you facing? We utilized a ball to throw to a person to speak next. We kept the meeting within 15 minutes.

At first, the students were very hesitant at the scrum meetings. They passed the ball directly to the person standing beside them. And they barely spoke of their challenges. It took at least two weeks before the students were comfortable to begin speaking up and getting energized. Then the scrum meetings became very helpful. They made the students accountable. No one was late after the first week of seeing that the meeting began without them. Everyone completed what they said they would because they had to report back each session. Challenges were addressed promptly. And throwing the ball back and forth across the circle really energized the group before getting started.

Hosting and Registering the Website

The students were asked to build a website that focused on providing information about the Pavarotti Center. The website needed to be easy for the Pavarotti Center's teachers to maintain. The Center also requested to have a domain name that used its name and had the Guatemala country code. This meant they could not use a free hosting site. The students needed to find something that would be financially sustainable for them. The Pavarotti Center did have a website in the past. But, they were unable to continue to pay the hosting fees. This was something the students needed to keep in mind as they researched their developing and hosting alternatives.

After reviewing several options, the students quickly realized this was not an easy task. When taking into account all of the client's needs, they determined that the best option was to use a Wordpress site hosted on Wordpress.com and registered through a company called .GT. While the students wanted to build a website from scratch, they felt the maintenance would not be as user friendly for the teachers. In addition, the hosting costs were simply not sustainable. So the students confirmed the domain name with the client and registered the name through the

Guatemalan registry. In addition, they obtained hosting services for the site. The students met their deadline for this item according to their schedule and were on track.

Fundraising
The students wanted to raise funds to help support the hosting of the site. They contacted several restaurants to determine which one would give the best deal for a percentage of sales back to the Pavarotti Center. The students selected a restaurant and began advertising on campus. They also asked the School of Business Dean to support the fundraising efforts. In the end, the students raised enough funds to support the Pavarotti Center to host and register their domain for 5 years.

Building, Feedback, and Documentation
The students gathered information from the technology teacher through email letters. In addition, he gave them information from their former website as well as the Rigoberta Menchu Tum Foundation website. The students used this information to begin building the site. They reviewed several different templates. The students originally thought they would be able to utilize the language widgets for the translation from English to Spanish and vice versa. However, upon building a few pages in English, they quickly realized that the Spanish translation wasn't quite the same. So the students opted to build each page in Spanish and English. This increased the expected time needed to build the site. However, a student in the course, while not fluent in Spanish, offered to help our native Spanish speaker with the translation. This helped the team get back on track with the schedule.

The students built a feedback loop into the schedule. They hoped to make adjustments before the end of the semester and before developing any end user documentation. They requested feedback from the Pavarotti Center, the DCGE director, CIS faculty and university students (this would be the demographic the Pavarotti Center would be trying to reach for the intercultural tourism opportunity). The students received feedback from everyone except the Pavarotti Center (it was the end of the school year for the Pavarotti Center and a very difficult time to get in touch with them). So they made the appropriate adjustments and began developing the documentation. They determined that they would make any adjustments needed from the client while in Guatemala.

They created all of the end user documentation in Spanish for the Pavarotti Center. It included a user manual for both the front end and the back end of the website. The documentation also included all information in regards to accounts for hosting and registration. This included renewal dates and contact information as well as how the Center will need to renew each item. Everything was completed and ready by the final exam week.

Training and Handoff
While in Guatemala, the students worked with the Pavarotti Center director and the technology teacher. They first stepped through every page of the website and took notes on anything that they would like to have changed prior to the students' final handoff. There were a couple of cosmetic changes that they asked for which the students changed that evening. In addition, the students took new pictures while in Guatemala and updated the website with additional photos.

After the initial walkthrough, more in-depth training sessions with the technology teacher were done. These consisted of training him how to update, add, delete, etc. pages. The students then had him add new posts to the page regarding recent news. They explained the difference in the Spanish and English site and how to update both versions.

As a final step, passwords, usernames and contact information were changed over to the client. All documentation was given to the client. At the end of the training, the client stated he had no questions because the students came so prepared and the documentation was thorough. The project was successfully accepted by the client.

Intercultural Tourism
The students completed their hand off of the project on the third evening in Guatemala. There were still five more days. This was all spent having a cultural exchange with the students and teachers of the Pavarotti Center. This was a time for us to learn from them and for them to learn from us. Some of the things we did was learn about the history of the Pavarotti Center, help out in the classrooms, and learn how to make crafts and how to play the Marimba. We went out on the fishing boats with local fishermen, visited local markets and coffee cooperatives, and visited the homes of some of the students. We also participated in a Mayan ceremony. The students practiced an American dance and taught it to the Pavarotti Center students during a celebration at the end of their stay. And there were many more activities throughout our time there. Each night the students gathered together and reflected on the day's activities. It was a good time to discuss

expectations and surprises. You could truly see the impact of the trip and how the relationships they were building went well beyond a one-time project.

Reflection

The course provided numerous opportunities for reflection before, during and after the experience. As discussed, we felt that having reflection opportunities throughout the course would benefit the student more than just after the action component. There were five structured reflections during the fall semester.

The first reflection was completed on the first day of class. They had one reading about why Guatemala was one of the happiest countries in the world. The reading asked students to reflect on their motivations for joining the course and what their thoughts were in regards to global service engagement. In addition, it asked them to reflect on their assumptions about Guatemala and to discuss the challenges they thought they may face.

For the second reflection, the students watched a video on the Guatemalan genocide. They then had to reflect on how/if that challenged the previous readings. Did it make them feel differently about Guatemala? This was the first time most students had ever heard about the genocide.

The third reflection was presented after students had developed their work break down structure report. They were asked to reflect how they felt. Did they capture everything that the client needed? What challenges did they foresee? After watching the Ted Talk "What's wrong with volunteer travel" (Papi, 2012), how do they now view their project?

The fourth reflection asked the students to discuss any new insights they had gained from the readings, videos, and meetings regarding Guatemala and the Pavarotti Center after the sessions they had with the DCGE director. They were required to read "What is Asset Based Community Development (ABCD)?" (Collaborative for Neighborhood Transformation, 2014) and write how they could see utilizing ABCD in the next steps assessment paper.

The last reflection of the fall semester occurred after the students finished building the website. The students were asked to reflect on how they felt about what they had accomplished. What were they most excited about traveling to Guatemala and what did they hope to see come from the project?

Prior to leaving for Guatemala, the student leaders met with the DCGE director to discuss how to lead meaningful reflections. Each morning at breakfast in Guatemala, the student leaders would ask the students to focus on a particular area, for example, "community". And each evening the student leaders would lead the group in the reflection discussions first surrounding the focus area. And the discussions would tie back to the project and how the project fits in to that area.

Additional reflection was completed as a part of the evaluation and the share components. This is explained further in the next two sections.

Evaluation

Part of evaluation is gathering community feedback. The goal was sustainability both manageably and financially. The technology teacher was very happy with the website. He was amazed with how well the students documented how to do each task. The students started with a tool that was easy to maneuver and backed it up with clear documentation. They chose a low-cost hosting service that still allowed for the Pavarotti Center to use their name for the domain name and have the Guatemalan country code.

During the trip the students were gathering information to complete their last two assignments of the semester, a travel journal and a next steps assessment paper. The travel journal was filled with their thoughts from the activities they did throughout their time in Guatemala. The journal reflected many of their thoughts that were brought up from the reflections discussed nightly. They submitted a final reflection that was taken from their travel journal after they returned. The final reflections indicated students overall found an appreciation for the Guatemalan culture. Many discussed how surprised they were at their ability to build relationships without knowing the language. Several discussed their desire to complete additional trips like this. Students discussed their increase in technical knowledge and their confidence in their ability to help communities using these skills sets.

The next steps assessment paper was to be based on the ABCD model. This was where they were to make suggestions for the Pavarotti Center of things they could do next in utilizing the assets they currently have to move forward in reaching their goals. They recommended that they utilize the English teacher to help the technology teacher in translating the English side of the

website. They even suggested using it as an assignment for some of the older students. The purpose of these last two assignments was to really wrap up the experience in the course with answering the questions, "what impact did this experience have on me" and "where can the Pavarotti Center go from here."

Share
Students from the course were asked to come speak at an information session for another course set to go to the Pavarotti Center. The students came and described the work they did, the relationships they built, and the things they learned. The students were so excited to talk about their experience and how they planned to do more.

Another way the students shared was through a poster session. The students had an abstract of their experience accepted to an inter-professional poster day that was held at our university. They had an opportunity to discuss their experience with students from other disciplines and hear about their experiences.

4. CHALLENGES & LESSONS LEARNED

There were definitely some challenges and lessons learned from this first experience. One of the biggest lessons learned was it was a mistake not to select a specific project manager in the class. While students were assigned specific activities on the schedule, there wasn't one person overseeing the whole schedule. The student leaders managed the travel portion and reflections, but not the project itself. The thought was to give everyone an equal part in the project. But that ended up with a lot of indecision.

There is such a short time to learn the culture and history and to get the students truly engaged and connected. Therefore, the discussions that they had with the DCGE director about the relationship of the university and the Pavarotti Center that were held towards the end of the semester, needed to be moved up to the beginning of the semester. These discussions provided so much more of a connection. There also needs to be many more cultural discussions. This is an area where more is definitely better.

Early discussions of sustainability will save time in the long run. For example, there were times during the research phase when trying to find the right hosting service and website platform that the students were going round and round. Some were losing sight of the fact that $50 to us may not mean much, but $50 in Guatemala was very different. And if they had to continue paying that after we left, what did that mean and how long could they sustain that? So the earlier those discussions can be done, the better.

Working with an established partner was definitely a nice experience. If you have an office such as our DCGE, it is worth working with that office. They are experienced in the country and are able to help in not only setting up the experience, but also preparing you and the students for working in the area. The director was instrumental with providing the class with the resources needed in regards to articles and videos as well.

There were only seven students in the course. This seemed to be a good number for the ISL experience. This small number allowed us to travel together as a group and get to know each other well prior to traveling. This small group size also made working in Guatemala more manageable. This type of project can be expanded into a larger class size. However, there would be some additional challenges. For example, there would need to be more than one project or a larger project with several working parts. Another challenge is the cohesiveness of the group. This can change the dynamics of the course. However, there are ways to bring the group back together. You could still do pre-departure meetings where you connect the class. While in country, you can also do the nightly reflections to bring the group back together. The principles of the modified P.A.R.E. model can still be applied.

You do not necessarily need to speak the native language to travel to a country. As long as there are good translators, you are all set. We were fortunate to have a student who spoke Spanish. But even if we didn't, we had our translators with us. Most of the students had this concern in their original reflection, but all did very well throughout the trip.

5. CONCLUSION

There have been many studies discussing SL in the I.S. area. However, there has been a lack of papers describing ISL experiences in this program area. This paper describes an ISL experience in an I.S. PM course. It is framed using a modified P.A.R.E. model. We extended the reflection to be throughout the course and added a share component. Students learned PM skills and tools through coursework during the semester. They learned what SL is and how to properly engage in SL work. They also learned about the culture and

history of Guatemala. These three aspects were brought together through their service project for the semester. They worked with a middle school in Guatemala to successfully deliver a sustainable website. The students had a valuable and memorable experience that they can take with them and share with other students, potential employers, and future SL opportunities.

The modified P.A.R.E. framework can be utilized by other I.S. programs to begin ISL experiences at other universities. The best advice in beginning an ISL experience would be to first touch base with your DCGE office. Determining which relationships are already in place will make the transition much easier. Providing these opportunities for I.S. students within their own discipline will allow them to obtain the benefits of ISL experiences while simultaneously putting to practice the skills learned in the I.S. program.

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Appendix 1 PARE Model

The PARE Model consists of four steps: Prepare, Action, Reflection and Evaluation. Each step is described below.

Preparation consists of several items. This is when you determine which community you will be working with for the SL project. You set the goals and objectives of the SL project. You determine what the students' expectations and assumptions are about the experience. This is also when you prepare students for working with the community (John Hopkins University, 2017).

Action is where the SL project actually takes place. This can either be direct or indirect. This means that students may work on something that is directly interacting with the community. Or they may work on something that impacts the community, but the students are not directly interacting with the community (John Hopkins University, 2017).

Reflection is an extremely important piece of SL. This has been found to be a strong connector that bridges the service experience to the content of the course (Astin, Vogelgesang, Ikeda, & Yee, 2000). This should be done in a structured and guided format to prompt students. The original P.A.R.E model seemed to emphasize more reflection after the action component. However, we felt that reflection really would benefit the students if it were done throughout the time of the course.

Evaluation is where you determine if the goals and objectives of the course were met. You would ask the community partners if they felt they were satisfied with the project and experience. Here is where you evaluate the changes in the students' attitudes, understandings, knowledge about the community. This is when you evaluate what went well and did not go as you had hoped. You would determine what you would do better next time (John Hopkins University, 2017).