

SCALING UP ENTREPRENEURIAL-MINDED LEARNING IN MIS

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ABSTRACT

Entrepreneurship education motivates students to learn by experience in ways that are not limited by disciplinary boundaries. This teaching brief reports on the gamification of an entrepreneurial exercise in a Management Information Systems (MIS) undergraduate course. Students experienced the entire entrepreneurship process from ideation to launch of a real business and competed in a university-wide Shark Tank style summit. The objective of this project is to develop the students' knowledge and skills in critical thinking, communication skills, e-commerce building tools and entrepreneurship. Data was collected from 5 years of incorporating this entrepreneurial project in our course.

The assessment showed that the project-based learning approach enhanced students' abilities and confidence in entrepreneurship and fostered interdisciplinary convergence among teaching faculty with regard to pedagogical outcomes.

Keywords: Ecommerce, Entrepreneurship, Project Based Learning, Gamification.

INTRODUCTION

Entrepreneurship education within universities has come to be associated not only with a domain of knowledge but also a “method” of learning. Approaching entrepreneurship education as a “method,” according to Neck & Green (2011), emphasizes learning by doing; students are expected to play an active role in their own education by pursuing solutions to the problems they encounter in a project or exercise and without being limited to conventional classroom learning techniques or disciplinary boundaries.

For an instructor, creating such learning experiences poses a number of challenges created by modern university conventions, policies, and administrative structures. Courses based on traditional lectures continue to be the dominant paradigm and format for teaching and learning, inhibiting the development of more deeply experiential experiences that extend beyond the time and place of the scheduled classroom. Modern university education also remains primarily organized along disciplinary lines, creating boundaries between faculties and divergent ways of evaluating learning—a problem that has been shown to inhibit entrepreneurship education (Wadhvani & Viebig, 2021; Landstrom et al., 2022). And traditional conventions for grading and assessing students based on standardized knowledge raises concerns about how the inherently varied nature of experiential, student-driven education can be assessed with confidence.

In this teaching brief, we describe an innovative design for cross-disciplinary experiential education in entrepreneurship that was designed with the goal of addressing the challenges of format, disciplinary boundaries, and assessment conventions described above. Introduced in a Management Information System class and tracked over five years, the program was designed to allow student-driven experiential education that extended beyond the classroom and involved faculty from schools of engineering and business. We present evidence on both the design of the

program and five years of assessment data that suggest its effectiveness in overcoming the limits described above.

LITERATURE REVIEW

Incorporating an “*entrepreneurial mindset*” into classes not formally designated as “*entrepreneurship classes*” can be one way to foster active learning by students. Through the implementation of creative entrepreneurship exercises, students develop concept models, feasibility studies, business plans, and implementation plans for businesses and innovative ventures, both profit-oriented and non-profit (Neck & Green, 2011). One university program explains how entrepreneurship offers an expanded educational landscape: “*A true hallmark of the [entrepreneur] E-scholar program is that it overcomes common barriers to learning. Students are exposed to other useful learning environments outside the classroom; they can tap into expertise of numerous business professionals besides their professors ...-*” (Johnson & Envick, 2014). In such experiential settings, students who are passive in classroom situations are encouraged to engage more willingly with individual and team tasks (Krueger, 2007). Entrepreneurship education within and beyond the traditional classroom has been reinforced through the emergence of on-campus or community-based entrepreneurship centers, which are good sources of guest speakers and other activities (Kuratko, 2004).

In addition, entrepreneurship programs uniquely support learning about starting a new business from the ground up (venture creation) by increasing creative thinking and opportunity-seeking into the mindsets of their students (Gorman et al., 1997). Students learn integrated approaches to applying relevant data and information sources to problem resolution. Part of the intentional design of the cross-disciplinary programs is to effect student learning at higher levels of Bloom's taxonomy (Anderson & Krathwohl, 2001). In summary, entrepreneurship education is seen to make students more prepared for problem solving and leadership roles (Ratten, 2017).

However, a number of conventions of modern university pedagogy make it challenging to design deeply active experiential education in entrepreneurship. First, university education continues to be designed predominantly around the standards of classroom lecture courses, in which student learning is delimited to particular times and locations rather than facilitating deeper engagement beyond the classroom. These parameters inhibit opportunities to actively integrate “*experiences*” of talking to customers, competitors, and mentors into a course.

Second, disciplinary conventions and divisions between faculties, who are trained to think, teach, and evaluate student work based on the standards specific to their discipline, create coordination problems when it comes to the cross-disciplinary nature of entrepreneurship education. Research has shown that these disciplinary divisions have not only created a barrier to entrepreneurship education (Wadhvani & Viebig, 2001) but also that entrepreneurship educators often cluster into different networks (Landstrom et al., 2022). As a result, communication and convergence around common goals and ways of evaluating learning create barriers to more immersive programs. Finally, the very fact that experiential education inherently involves individual differences between students raises concerns about assessment.

Management Information System is a field adopting entrepreneurship pedagogy to capitalize on opportunities and ensure that graduates are more strategic and innovative in planning for their futures. Implementing entrepreneurship in MIS programs enable students to share new business models with people in the surrounding community (Canziani & Welsh, 2021) and at the same time, students develop connections with information resources that can help them

achieve their own entrepreneurial goals (Bosma et al., 2008). This is true on a national as well as international level (Acs, 2006; Carree & Thurik, 2010). In this project-based learning exercise, we used game dynamics to incorporate entrepreneurship education into MIS in ways that motivated students to participate in class activities and improve their skillset. Gamification in education is the use of game mechanics and elements in educational environment. According to Kapp, gamification is “*using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems.*” (Kapp, 2012). It is stated that using game mechanics improves the ability to learn a new skill by 40% (Giang, 2013). Stott & Neustaedter (2013) presented case studies to see the effect of theoretical 'best practices' in the gamification of education.

Their study showed that there is no once-size-fits all model for the successful gamification of a classroom; however, a successful implementation of game dynamics will increase a feeling of agency and ownership in the user. Isabelle (2020) implemented an online gamification platform for an entrepreneurship course which integrated Shopify. The assessment of student learning outcomes shows an enhancement in student experience and self-efficacy. Kauppinen & Choudhary (2021) implemented an online game called Kahoot, to analyze the effect of entrepreneurship on students. Their study shows that using an online game as well as offering gifts to the best players motivates students to participate in class activities but doesn't have a high influence on their ability to recall information. Chen et al. (2022) implemented a gamified social entrepreneurship startup project called “*Innovation Farm*” to teach the concepts and application of Artificial Intelligence (AI) to students. Survey results show an enhanced level of understanding of AI through the learning experience about real-world projects.

An Approach to Incorporating Entrepreneurship in Ecommerce Course

Course objective: This research is based on the 4-unit required Ecommerce course offered every spring for MIS students, at a midsize university in California, USA. The course is designed to give technically oriented students a basic understanding of the technologies used in developing ecommerce information systems, how to design such systems, and how to manage and maintain them. The course was previously offered using traditional teaching methods with an emphasis on creating a website on Visual Studio. However, with the growth of web development platforms, the student learning objectives of this course have focused more on entrepreneurial thinking and problem solving. The semester project deliverables have evolved throughout the years and has been changed from focusing on technical website development to creating business plans and focusing on the entrepreneurial aspects of one's idea. However, the same rubrics were provided as guidance to the students and a way of evaluating the projects. The goal was to provide students with a hands-on opportunity to create a data focused venture and have the experience of presenting their venture in a university-wide Shark Tank style event Appendix A.

The learning objectives of the course are to:

- Describe the different information technologies currently available for providing client/server and web -based access to data sources, and the major contemporary issues associated with these technologies such as security and privacy.
- Develop solutions for implementing an ecommerce venture.
- Create a marketing plan and promotional plan for an ecommerce venture.
- Successfully launch an entrepreneurial venture and present at the annual XYZ Summit.

Entrepreneurial Semester Project Deliverables

The semester project focuses on creating a business plan, financial forecast, and app development. As part of their project students were to compete in the Pacific Innovation and Entrepreneurship Summit (PIES) and, therefore, the projects followed a general format adopted by the Engineering and Business schools. The project was first introduced in Spring 2017. In total 40 group projects were completed over the following 5 years. Students taking this course were junior and senior MIS students with less than 2% computer science students. The groups consist of 3-4 students and created after a set of mini activities and brainstorming sessions for students to get to know each other and form groups based on their similarities and interests for the project. Students were surveyed at the beginning and end of the semester to assess their experience and the impact of this project on their entrepreneurial self-perception. The survey results are presented in sections 4.2 and 4.4.

Pacific Innovation and Entrepreneurship Summit (PIES)

PIES are a gathering of students, faculty, and alumni interested in innovation and entrepreneurship. The goal of PIES is to showcase the work of students, to develop a common community of students interested in innovation and entrepreneurship, and to discuss entrepreneurial ideas and opportunities for the future.

This is a yearly event where multidisciplinary student teams display their innovative “ventures” in a trade show with poster presentations to the public. Teams will do a Shark Tank style pitch to a panel of entrepreneurs comprised of alumni and regional business leaders.

Access to Subject Matter Experts

To provide guidance and mentorship for students participating and competing in PIES, mentors were available for students to get feedback during their idea initiation. Mentors are experienced entrepreneurs, engineers or investors who are willing to roll up their sleeves to give specific guidance to the teams. Mentors/advisors provide guidance through four faces-to-face or video conference meetings that are focused on the following topics:

- Evaluate opportunities (inspiration)
- Provide support in prototyping and testing the idea (ideation)
- Review the pitch and make sure the team is ready (implementation)
- Debrief and discuss the lessons learned after the event (closing)

Project Evaluation Results

In this section we present the project evaluations from different perspectives.

- Section 4.1: the assessments are based on assignment categories and done by the course instructor.
- Section 4.2: pre and post survey analysis on management and leadership, teamwork, communication, presentation and innovation and creativity skills.
- Section 4.3: project evaluations during PIES by the judges. Each project was scored based on each team’s pitch deck and on 5 different categories.
- Section 4.4: end of semester survey analysis on students’ experience in PIES and the project.

Project Assignment Evaluation

Three assignment categories -- pitch deck, software application and solution design -- were used to evaluate the projects and analyze students’ performance throughout the years Table 1. The evaluations were performed by the teaching instructor of the course at the end of each semester.

Analysis of the resulting plots enables an in-depth evaluation of our e-commerce semester project, student progress, and assessment rubrics from multiple perspectives.

Table 1 ASSIGNMENT CATEGORIES AND RUBRIC ITEMS FOR EACH	
Assignment category	Rubric items
Pitch deck	<ul style="list-style-type: none"> ➤ Make an argument for exigency. ➤ Provided a non-technical explanation of the solution. ➤ Clearly stated a value proposition. ➤ Provided a clear path to move forward.
Software application (Evaluation was focused on visualization, usability, comprehension and performance)	<ul style="list-style-type: none"> ➤ The application is presented in an aesthetically pleasing manner. ➤ The application is easily navigated, has intuitive controls (e.g., buttons) and presents ➤ A noticeable, clear objective. ➤ The application conveys the lesson material ➤ In an understandable fashion for the targeted grade level or age group. ➤ The application is free of noticeable errors and operates as expected by a typical user.
Solution design	<ul style="list-style-type: none"> ➤ There is sufficient background information provided to introduce the audience to the design. ➤ There is evidence of creativity in both form and function. ➤ The solution provides a competitive advantage over existing products or solutions. ➤ The solution is well presented.

Results from twelve different metrics of evaluation for forty student projects is presented in Figure 1 and shows continuous improvement of student progress throughout the years.

However, the improvement is greater in pitch deck and problem innovation categories.

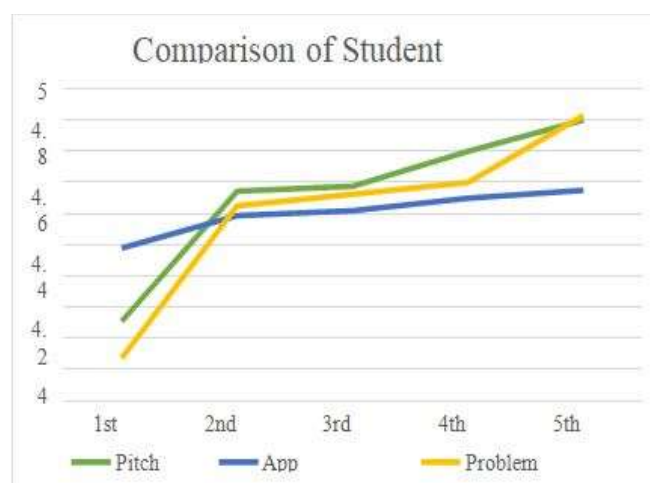


FIGURE 1
COMPARISON OF STUDENT WORK IN THREE ASSIGNMENT CATEGORIES

Student Entrepreneurship Mindset Evaluations: Pre and Post Project Results

In the last three years of the study, students were surveyed at the beginning and end of the semester on their knowledge and beliefs on creativity, innovation, and entrepreneurship. The survey questions are in Appendix B.

The results of these surveys are contained in Figure 2. The results demonstrate modest improvements in students’ own self-assessments of their entrepreneurial mindset and efficacy.

Additional feedback was collected at the end of semester on student’s experience in PIES that is presented in section 4.4.

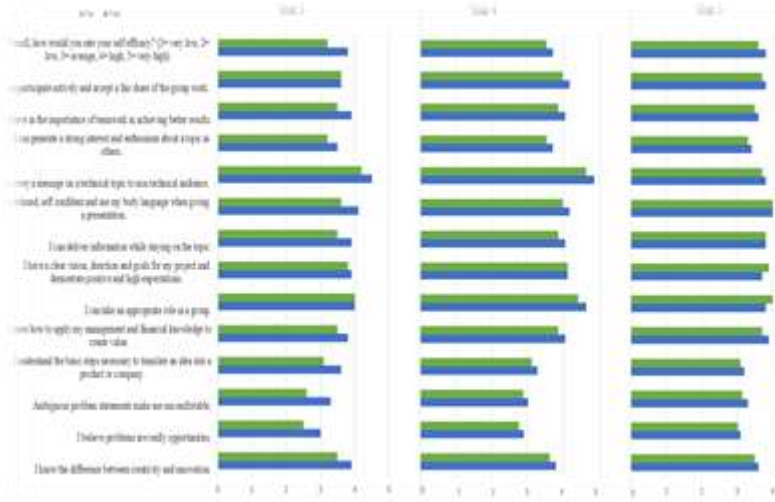


FIGURE 2
RESPONSES TO THE PRE AND POST SURVEY QUESTIONS

Project Evaluation through PIES

In the next assessment stage, the PIES judges who consist of two faculties from the Engineering School and two faculties from the Business School evaluated the problem innovation aspect of the project based on the students’ pitch deck presentation. The same faculty were involved in the summit and evaluating the projects throughout the five years. Figure 3 shows the project pitch deck evaluations by PIES judges. The comparison of evaluations throughout the years shows an improvement in the quality of the projects in different criteria.

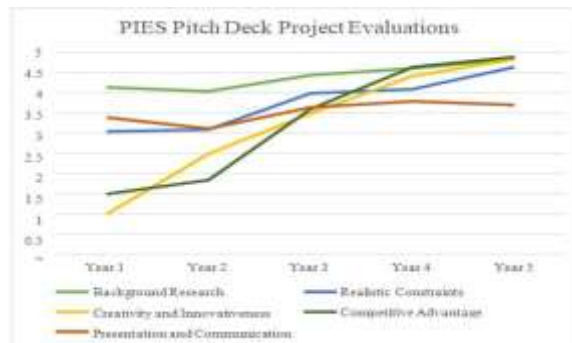


FIGURE 3
PROJECT EVALUATIONS THROUGHOUT THE FIVE YEARS

In our analyses, standard statistics on the collected data as well as the Cohen’s kappa (κ)

Were calculated. Cohen’s kappa is a statistical measure of inter-rater reliability and can be used to provide additional insight on the level of agreement between two assessors evaluating a population of subjects. The kappa value is calculated as:

$$kk = \frac{pp_{aa} - pp_{ee}}{1 - pp_{ee}}$$

Where, pp_{aa} is the relative number of observations in agreement, and pp_{ee} is the probability of an agreement occurring by chance. In the following, the alignment between faculty ratings and their kappa agreement is illustrated Figure 4.

The results from the Cohen Kappa agreement analysis suggests that Business faculty tend to rate projects slightly higher in all categories except the presentation and communication skills. In presentation and communication, the Engineering faculty assessed the project more positively than Business faculty, with higher average and smaller standard deviation.

However, the Business faculty assessed the projects higher in creativity and competitive advantage. The highest agreement between faculties was in competitive advantage and the lowest agreement in background information category.

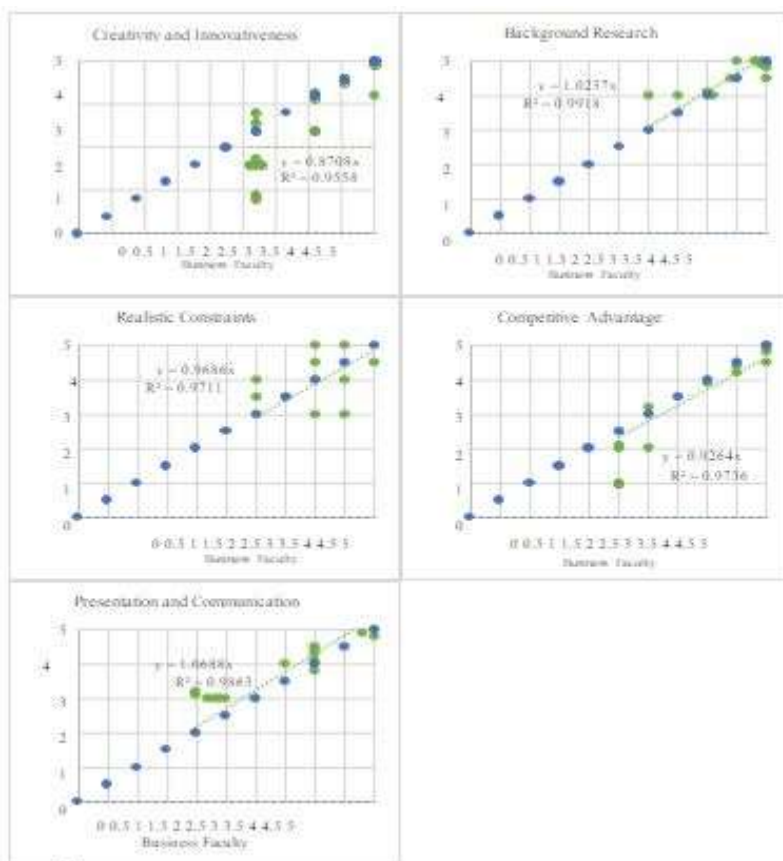


FIGURE 4
COMPARISON OF ALIGNMENT BETWEEN FACULTIES RATING IN 5 CATEGORIES

Students' end of Semester Survey on PIES

At the end of the semester students were asked to take anonymous surveys to assess the project experience and the summit. The results are contained in Table 2. The participants reported their agreement with statements using a Likert-like scale (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5= Strongly Agree). The survey questions are in Appendix C

D. Student responses indicated that they found the project to be effective and exciting to work on and it enhanced their creativity skills.

Students' responses on PIES event decreased in the last year compared to the previous years. This may be because of the format of the event changing to virtual due to COVID-19 restrictions and the lack of interaction and communication between participants and judges. Also, we noticed that the standard deviation of the responses on PIES questions are higher than other categories and this could be due to different students' experience and how they took advantage of the event and used it as a venue for networking.

Statement	Year 1 (n=21)	Year 2 (n=19)	Year 3 (n=25)	Year 4 (n=20)	Year 5 (n=25)					
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
I received good feedback and support from the professor.	3.32	0.8	3.85	0.5	4.2	0.72	4.26	0.78	4.2	0.8
I received good feedback and support from the mentors while working on the project.	3.12	1.2	3.72	0.93	3.8	0.76	4.2	1.1	3.5	1.2
The time frame of the project and the deadlines were reasonable.	4.01	0.81	4.1	0.72	4.21	0.51	4.3	0.82	4.2	0.9
The project deliverables were effective and contributed to my understanding of the subject.	3.95	0.92	4.37	1.33	4.45	1.23	4.65	0.71	4.41	1.3
Overall, how would you rate the importance of the project? (1=very low, 2=low, 3=average, 4=high, 5=very high)	3.9	0.75	4.2	0.96	4.4	0.71	4.52	0.8	4.35	0.9
After participating in PIES, I am more confident regarding my knowledge and potential.	3.85	0.68	4.32	0.46	4.75	0.56	4.9	0.7	4.45	0.76
Participating in PIES made me more aware of the importance of what I learn in MIS courses.	3.7	1.33	4	1.22	4.7	1.05	4.85	1.55	4.5	0.95
After participating in PIES, I am more confident to enter the	2.9	0.68	3	0.74	3.75	0.94	3.85	0.8	3.75	1.1

workforce and apply for jobs.										
Participating in PIES helped me apply what I learned in classroom in a semi real-world project.	3.8	0.73	3.9	0.8	4.45	0.85	4.85	0.9	4.41	1.2
Overall, how would you rate PIES (1=very low, 2=low, 3=average, 4=high, 5=very high)	3.2	0.56	3.5	0.76	4.25	0.61	4.46	0.62	3.8	0.53

The following student comments from the anonymous survey and course evaluations show the impact of this project on the students:

- PIES were fun and gave us an experience to network with local company owners and alumni.
- It was challenging as you were on the deadline, but it was very rewarding at the end especially that we won!
- Fun, practical, and hand-on experience.

CONCLUSION

In this paper we presented and assessed the gamification of an undergraduate ecommerce course designed to enhance students' entrepreneurial skillsets and mindset. The gamified semester project has been revised to focus more on entrepreneurial thinking and communication skills as well as e-commerce web building tools.

Student projects and presentations were evaluated by Business and Engineering faculty on different criteria such as problem identification, creativity and innovativeness, competitive advantage and presentation and communication skills.

A two-dimensional plot was used to analyze alignment between evaluators, and inter-rater reliability was evaluated using the Cohen's kappa statistics. Results showed similarities between the ratings in all categories except creativity and innovativeness, which Engineering faculty tend to rate harsher and the average was significantly lower than Business faculty. The result shows continuous improvement in innovativeness of student projects.

The post survey results show that students responded positively to the learning experience about real-world projects and have demonstrated increase knowledge in entrepreneurship skills and self-efficacy.

These findings point to broader implications about the potential value of gamification and entrepreneurial mindset orientation in overcoming challenges to pedagogical innovation in university settings. Classroom conventions, disciplinary boundaries, and standardizing testing techniques inhibit opportunities for engaged and open-ended learning by doing in higher education (Wadhvani & Viebig, 2011). The program and assessments presented in this teaching brief suggest that cross-disciplinary entrepreneurship projects provide a way to over these boundaries. They do so by creating a structure in which faculty as well as students can collaborate in ways that move beyond the limits of the time-delimited classroom.

Appendix A PROJECT DELIVERABLES		
Project deliverable	Description	Project weight
Project proposal	The proposal consists of the name for their company, and internet address. Students were to do an industry analysis using Porter's 5 competitive forces model, specify the company's mission and a business description of what it does. They were asked to decide on their review model and the competitive advantage of their project.	5%
Value proposition canvas	The value proposition canvas ensures that their business idea is positioned around what the customer values and needs.	10%
Business model canvas	The business model canvas describes their idea's value proposition, infrastructure, customers, and finances.	10%
Financial forecast and assumptions	In the financial forecast, they will predict how their business will perform in the next 5 years and indicate any assumptions made for this.	5%
Pitch deck	Present their idea in less than 5 minutes.	5%
Business plan	The business plan describes the problem and the proposed solution and consists of market analysis, execution, and financial plan.	15%
Website development	Create a website using any free available platforms.	15%
App development	Create an app in Android Studio.	30%
Participate in PIES	Participate in the PIES poster and pitch competition.	5%

Appendix B PRE- AND POST- SURVEY QUESTIONS					
Please rate your agreement with each statement	Rating				
	1	2	3	4	5
I know the difference between creativity and innovation.					
I believe problems are really opportunities.					
Ambiguous problem statements make me uncomfortable.					
I understand the basic steps necessary to translate an idea into a product or Company.					
I know how to apply my management and financial knowledge to create value.					
I can take an appropriate role in a group.					
I have a clear vision, direction and goals for my project and demonstrate positive And high expectations.					
I can deliver information while staying on the topic.					
I am relaxed, self-confident and use my body language when giving a presentation.					
I can convey a message on a technical topic to non-technical audience.					
I can generate a strong interest and enthusiasm about a topic in others.					
I believe in the importance of teamwork in achieving better results.					
I can participate actively and accept a fair share of the group work.					
Overall, how would you rate your self-efficacy? (1= very low, 2= low, 3= average, 4= high, 5= very high)					

Appendix C					
END OF SEMESTER SURVEY					
Please rate your agreement with each statement	Rating				
	1	2	3	4	5
I received good feedback and support from the professor.					
I received good feedback and support from the mentors while working on the Project.					
The time frame of the project and the deadlines were reasonable.					
The project deliverables were effective and contributed to my understanding of the Subject.					
Overall, how would you rate the importance of the project? (1=very low, 2=low, 3=average, 4=high, 5=very high)					
After participating in PIES, I am more confident regarding my knowledge and Potential.					
Participating in PIES made me more aware of the importance of what I learn in MIS courses.					
After participating in PIES, I am more confident to enter the workforce and apply For jobs.					
Participating in PIES helped me apply what I learned in classroom in a semi real-World project.					
Overall, how would you rate PIES (1=very low, 2=low, 3=verage, 4= igh, 5=ery high)					

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