Workshops and Seminar Series to Enhance and Create Opportunities for Innovation in Green Manufacturing and Engineering

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Arturo Olivárez, Jr., Professor. He is a professor of educational research with emphasis on quantitative methods and the application of univariate and multivariate statistics, measurement issues across diverse populations, educational assessment, and evaluation of educational programs. He holds the Patricia Daw Yetter Professorship in quantitative methodology and program evaluation, and coordinates the Research and Evaluation Laboratory (REL) in the College of Education at UTEP. He is an expert on educational research with an emphasis on quantitative methods and the application of univariate and multivariate statistical procedures, measurement issues across diverse populations, educational assessment, and evaluation of educational programs. He has served on over 87 doctoral dissertation committees; published more than 45 refereed research articles; and presented at more than 100 international, national and regional research conferences. Some of his more general research areas of interest include teacher and student's self-efficacy and motivation research, reading and mathematics education research, and quality of teacher preparation research. Recently, he concluded several educational program evaluations across Texas in the areas of reading, bilingual education and technology. Three of the most recent evaluations include study on middle school students writing, evaluation of the impact of technology in schools, Reading First Grants, a bilingual education program, a nursing student training program funded by the NSF and a Department of Education grant in Green Energy Manufacturing curriculum development. Currently, he is involved in the evaluation and research of two federal grants regarding student success. One of the grants aims at providing undergraduate engineering minority students opportunities for acquiring 21st century knowledge and skills required to compete with a technology-rich workforce environment. The second grant aims at providing educational and administrative support to undergraduate student in areas of career and financial management planning. He has been selected as Research Fellow at the Educational Testing Service at Princeton for two consecutive summer terms. He has been program chair and president of the regional association (Southwest Educational Research Association) and presently active member of American Educational Research Association's Division D (Measurement) Graduate Student Welfare and Mentoring Committee and program chair for AERA's Professors of Educational Research SIG in 2014-2016.

Educational Background:

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WORKSHOPS AND SEMINAR SERIES TO ENHANCE AND CREATE OPPORTUNITIES FOR INNOVATION IN GREEN MANUFACTURING AND ENGINEERING

Abstract

This paper describes a series of workshops and seminars conducted as a part of Industrial, Manufacturing and Systems Engineering (IMSE) Day at The University of Texas at El Paso, with a goal of providing students from El Paso - Cd. Juarez region with opportunities to grow and develop engineering and leadership skills. Considering the global use of green engineering and green manufacturing technologies by industries for minimizing environmental impact and increased resource utilization, IMSE day 2016 was specifically geared towards introducing students to new information age technologies and their application in the fields of green manufacturing and engineering. The conducted workshops and seminars are based on the theme "Internet of Things" (IOT) to reflect the interdependent nature of manufacturing processes and the ability of IOT to improve visibility in manufacturing. The authors provide a detailed overview of all the workshops and seminars conducted along with a detailed assessment of IMSE day 2016 based on student feedback.

Background

The term Internet of Things (IOT) is used to define enabling the connectivity of several devices helping them to connect with each other and even communicate with a user. It can be looked at as a network of systems which are connected to internet, thereby enabling them to have their own IP address, thus connecting with each other and automating tasks[1]. From the perspective of a manufacturing continuum, factories that are connected to internet are more efficient and are productive compared to their counter parts[2]. According to John Nesi, the vice president of Rockwell Automation, it is seen that only 10 percent of industries are operating as a connected enterprise, helping them to improve their manufacturing functions. HE also mentions that the connected enterprises not only speed up their process but also make the environment safe for their employees[2]. With the observed increase of connected devices in place through the platform provided by Internet of Things, there is a growing concern on how educators use and support IOT and introduce it to the emerging workforce. According to a study published by Gartner Group, it is estimated that more than 20 billion devices will be connected to the IOT by 2020[3]. Based on the increased need to introduce students to the IOT platform, the authors in this paper talk about a series of workshops and seminars conducted on the theme of Internet of Things on IMSE day 2016 conducted at The University of Texas at El Paso (UTEP). The main goal of the workshop and seminar series was to introduce the student to IOT and reflect upon the interdependent nature of manufacturing processes and the ability of IOT to improve visibility in manufacturing.

Workshop and Seminar Series

This paper provides the results of the activities conducted during the 2016 spring semester by the Green Manufacturing Education and Leadership grant at UTEP. The purpose of evaluation is to review and assess the quality of a series of invited seminar and workshop presentations and the degree of perceived level of knowledge acquisition from the Sessions and Workshop Program participants. IMSE day provided for the delivery of several invited presentations by several distinguished professionals in the field as keynote speakers. There were six major seminar

presentations by experts across various engineering disciplines to provide to the student participant the opportunity to receive and view current cutting-edge development and applications of the "Internet of Things-IoT" and how these may apply to various aspects of Green Energy Manufacturing topics in the field. In addition, the participants were able to hear and participate (interactively) with three other presenters whose expertise ranged from mechanical engineering to health informatics. Their job was to not simply present the general concepts of IoT but to link them to GEM-related problems and solution with ample opportunity for the students to have a more active role to these real-world activities.

IMSE day 2016 included three major workshops delivered by regional, state and nationally recognized experts in the fields of Leadership, Green Manufacturing, and distributed decision support and health informatics. The results of these professional development workshop activities were expected to be of the highest quality and utility for the conference participants, mainly undergraduate and graduate students in the various departments from the College of Engineering and related fields. The task of the participating students was to play an active role on these workshop activities (i.e., asking questions, interacting with presenter as well as with other student participants, etc.) Two key valuable features of the sessions were to target the quality of the delivery of the workshop and the potential acquisition of new concepts and skills acquired by the workshop participants. Thus, the research questions addressed include:

1. Were the individual invited presentations and professional development workshops presentations of highest quality and effectiveness as reported by the program participants and conference organizers, thus meeting organizers' expectations?
2. Were individual conference participants able to report improvements on content knowledge, concepts, dispositions, and skills from each of the sessions and workshop presentations as assessed by various cognitive assessments of these workshops' content?

Method

Participants:

The targeted program participants were undergraduate and graduate master's students at various stages of their program with major emphasis on upperclassman.

Design:

The design used to address the research questions was a cross-sectional design which allows for the gathering of individual's perceptions and opinions about fundamental aspects of a program, issue, or intervention. This type of design is very effective since it provides a quick "snapshot" of current skills, behaviors, attitudes, and beliefs in a particular population.

Instruments:

As a means of assessing the quality of the individual workshop presentations, a workshop evaluation scale was developed. This evaluation scale consisted of key demographic items about the participating students and 15 separate items that addressed the particular quality and degree of perceived effectiveness and usefulness aspects of the nine conference's invited presentations and workshops, see Appendix A. In addition to this dispositional survey all five keynote invited presentations, five content-based quizzes were developed and administered for the five professional development activities. These knowledge-based performance tests were developed for each workshop presentation addressing the key concepts delivered by the workshop

presenters. A pre-test and a post-test research design were implemented to assess the amount of information acquired by the workshops' participants. Appendix B presents these tests for each of the delivered workshops.

Factorial composition of the presentation evaluation scale indicated that two latent but important components were functioning across the 15-item scale. One factor composed of 8 items describing various aspects of the presenter's effectiveness in presenting the material and engaging the participants emerged and a total overall average was computed. The second factor emerged with 5 distinct items describing various degree of alignment to the goals and objectives of the Green Energy and Manufacturing grant by the nine different presenters. Two unrelated items dealing with aspects of materials and/or handouts made available as well as ability by the presenter to address questions from the audience did not appeared to cluster with the two extracted factors. Appendix C describes this factorial structure of the presentation evaluation scale along with internal consistency reliability indices. The total scale (13-item) and the two extracted subscales yielded high levels of internal consistency (Cronbach's alpha). Overall averages from factor scores on these constructs were developed to ascertain overall quality of presentation, overall effectiveness of presenters, and overall adherence of presentation to GEM's goals. Thus, the paper includes an overall (15 item scale) evaluation of the presenter level of effectiveness and organization and a breakdown of these by two specific subscales addressing at a more specific levels not just overall effectiveness but presenters ability to make direct and indirect links to Green Manufacturing goals and issues.

Data Analyses:

Descriptive and inferential statistics were performed to examine both the quality and degree of effectiveness for the seminar and workshop presentations and the assessment of conference participants' new levels of acquired knowledge derived from the workshops presentations. Means, standard deviations and percentages were used across the various scales' totals and subtotals as well as basic assessment of the scales psychometric soundness is reported here. Qualitative information is also sought after from the conference participants by the inclusion of open-ended type and a constant comparative method for examining the content was also conducted. Modifications to the survey from comments received from previous conferences were included and analyses for these analyses.

The following section presents initially the findings obtained on how the participants rated the quality of the 9 different invited presentations and professional development workshops. Secondly, the section includes the results gathered from the participants' gain levels on this year's three professional development workshop presentations' conceptual content and skills.

Results and Discussion

Quality of Invited Seminars and Workshop Presentations

A total of 207 total valid responses were obtained from all 6 invited seminar presentations and 3 professional development workshop presentations with the majority of these demonstrations receiving at least 17 participant's evaluation ratings. Several of the seminars had about the same number of attendees with a large number of these participants taking the time to complete the surveys for these presentations and workshops.

Table 1 provides a more detail description of the participants' rating breakdown across all of the conferences activities. It was observed, and based on the percentage of student ratings, most of the professional development workshops did not yielded high number of attendees given that these were slated for afternoon delivery but none with less than 10 different evaluation ratings recorded about the overall quality of the seminar or workshop presentation. A breakdown as to the percentage of ratings yielded close to 78 percent of this total number of student ratings were attributed to the invited seminar presentations which were held on the first day and in the majority of them at the early stages of the conference. As in previous conferences, the larger percentage of participant ratings observed may be attributed to these presentation sessions had to do with the their focus on the assimilation of new concepts and ideas and there was no requirement for asking students to participate as they were asked to participate or play a more "active" role in the set of workshops which were held in the afternoon of the conference opening day.

Table 1. Frequency and percentages of the observed set of respondent's ratings who evaluated each of the workshops attended

Invited Presentations and Workshops	Frequency	Percent	Cumulative Percent
Session 1.	29	14.0	14.0
Session 2:	29	14.0	28.0
Session 3:	29	14.0	42.0
Session 4:	28	13.5	55.6
Session 5:	23	11.1	66.7
Session 6:	24	11.6	78.3
Workshop 1	10	4.8	83.1
Workshop 2:	22	10.6	93.7
Workshop 3:	13	6.3	100.0
Total	207	100.0	

Note: To avoid naming actual titles of presentations and workshops, the reader is referred to the program handout for detailed information as to each of this conference's activities.

Description of participants

For this year's attendance, the participants included 207 students from more than 8 different majors. The majority of attendees were male (48%) while 61 percent of the total attendees represented undergraduate students. Of this undergraduate group, 40 percent were seniors More than 14 percent of the students did not provided any type of personal demographics. The large majority of the participants declared a major or concentration in Industrial Engineering (48.3%) and Systems Engineering (15%). A total of 40 ratings came from those student participants who indicated a graduate level of educational training while only 8 ratings were observed from those in a doctoral training program on campus. As in years' past, this annual conference encourages students to participate in all of these events or activities, however, the majority of students in these academic programs are not full-time, concurrently, many of them are taking day-classes, some of them have work-related responsibilities, and they

also know that they may participate in any of these events as much as their academic schedule allows them.

Examination of specific evaluation items on the total attitude scale

In order to determine the perceived level of quality of across all of the presentation workshops, Table 2 presents the percentages for each evaluation item in the scale. These finding allows for the examination of how all participants perceived the quality and efficiency of the presentations and workshops' quality and efficiency using very general perception/attitudinal statements.

For this year's conference, it was clearly observed that for almost all the evaluative items, the

Table 2. Percentage of participants' attitude responses to individual items for all workshops presentations.

	Statements (Internal Consistency for the overall scale was 0.91)	SD %	D %	N %	A %	SA %
1.	Presentation clarified topic objectives (Not Applicable 1.4%)	1.4	1.0	2.4	1.9	68.1
2.	Presentation covered topic content or information (Not Applicable 0.0%)	1.4	1.0	3.9	25.1	68.1
3.	Presentation related topic to various project challenges (Not Applicable 4.8%)	1.0	1.0	8.2	30.4	54.1
4.	Presentation topic help apply theory to solve problems (Not Applicable 5.3%)	1.0	.	9.7	34.8	48.8
5.	Presentation facilitated to develop new set of skills (Not Applicable 1.0%)	1.0	1.0	1.4	14.0	52.2
6.	Presentation aided in the understanding of new concepts (Not Applicable 0.0%)	1.9	2.9	13.0	23.7	58.0
7.	Presenter's delivery strategies (Not Applicable 5.3%)	5.3	0.5	1.0	8.7	55.6
8.	Presenter's comprehensive knowledge of topic presented (Not Applicable 0.5%)	1.4	1.0	4.8	18.4	73.4
9.	Presenter's style of communicating information (Not Applicable 0.5%)	1.0	3.9	7.2	25.6	61.4
10.	Presenter's response to questions/queries by audience (Not Applicable 25.1%)	0.5	2.4	6.8	18.4	45.9
11.	Presenter's effectiveness in conveying topic concepts (Not Applicable 1.4%)	0.5	3.9	7.2	25.1	60.9
12.	Presenter's material or handouts during workshop (Not Applicable 10.1 %)	0.5	1.4	7.2	31.4	48.3
13.	Presentation met GEM's program goals and objectives (Not Applicable 7.2%)	.	1.0	7.7	26.6	56.5
14.	Overall organization of workshop session (Not Applicable 2.9%)	1.9	1.0	5.3	29.0	58.9
15.	Overall rating of this workshop session (Not Applicable 1.4%)	1.0	0.5	7.7	26.1	62.3

participants overwhelming rated the both the seminars and workshop presentations as either "Agree", or "Strongly Agree" with individual statements or items. Because presenters where not required to provide supporting material or handouts for their presentations and workshops, item # 12 appear not to be a relevant item on the overall assessment of the presentation's quality or effectiveness. About 10 percent indicated that the use of handouts was not applicable for the session. Similar high percentage of the "not applicable" option was observed for item #10 which dealt with the issue of the presenters allowing for questions during the presentation. More than 25 percent of the respondents selected this option. Of most importance are the results observed for all these seminar and workshop presentation are the results observed on the scale's item # 14 and # 15, the participants' percentage ratings exceed more than 88% of them rated these presentations as well organized and very good in their overall quality. Of some concern were the issues of several items being perceived as not applicable or not relevant to the goals and objectives of the conference? Appendix D provides a quick look at the principal component analysis of the evaluation scale and rationale for the creation of the subscales.

Descriptive Statistics for all Scale Statements

Upon examination of the presentation evaluation scale averaged values using overall means and standard deviation scores, it is observed that participants' rated these fifteen attitude scale statements very high with qualitative descriptors including a high degree of "agree" and "strongly agree" with very stable levels of variability. See Table 3.

Table 3. Descriptive statistical values for each evaluation item across all presentation.

Statements of Quality and Effectiveness	Mean	SD
i1=Presentation clarified key objectives	4.53	0.920
i2=Presentation covered topic content or information	4.58	0.746
i3=Presentation related topic to various GEM project's challenges	4.22	1.220
i4=Presentation topic help apply theory to solve problems in GEM	4.15	1.230
i5=Presentation facilitated to develop new set of skills	4.29	0.942
i6=Presentation aided in the understanding of new concepts	4.33	0.947
i7=Presenter's delivery strategies linked to GEM	4.22	1.241
i8=Presenter's comprehensive knowledge of topic presented	4.61	0.818
i9=Presenter's style of communicating information	4.42	0.916
i10=Presenter's response to questions/queries by audience	3.32	2.070
i11=Presenter's effectiveness in conveying topic concepts and ideas	4.39	0.987
i12=Presenter's material or handouts during workshop	3.96	1.521
i13=Presentation met some of the GEM's program goals and objectives	4.18	1.355
i14=Overall organization of this presentation session	4.35	1.103
i15=Overall rating of this presentation	4.55	0.920
Valid (N =205)		

Descriptive statistics of overall average for effectiveness and organization of presentations

To further determine if there were differences between and among the four different seminar and five workshop presentations, a breakdown across individual workshops was performed and Table 4 reports on these mean differences among them by reporting descriptive statistics including the respective standard errors due to different sample sizes. The only presentation that received a moderate or fair average score in overall level of quality and was rated by the lowest number of participants was presentation workshop # 3 with the rest of the presentation receiving "Agreement" or "Strong agreement" score averages. Figure 1 illustrates these descriptive statistics results graphically.

Figure 1. Descriptive statistics for all the presentations and workshops level of effectiveness

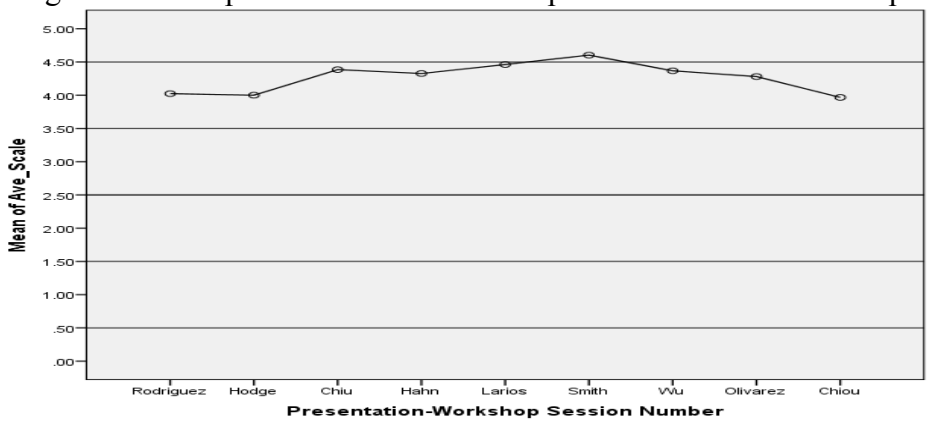


Table 4. Descriptive statistics for all the presentations including the confidence interval for the mean					
Presenters and Sessions-total scale	N	M	SD	LB	UB
Session 1. Rodriguez	29	4.0230	1.09447	3.6067	4.4393
Session 2: Hodge	29	4.0000	.88569	3.6631	4.3369
Session 3: Chiu	29	4.3839	.72499	4.1081	4.6597
Session 4: Hahn	28	4.3262	.58608	4.0989	4.5534
Session 5: Larios	23	4.4609	.65779	4.1764	4.7453
Session 6: Smith	24	4.6028	.56619	4.3637	4.8419
Workshop 1: Wu	10	4.3667	.65339	3.8993	4.8341
Workshop 2: Olivarez	20	4.2800	.69269	3.9558	4.6042
Workshop 3: Chiou	12	3.9667	1.11174	3.2603	4.6730
Total	204	4.2690	.80633	4.1576	4.3803

Descriptive statistics of overall average of presentation addressing GEM's goals

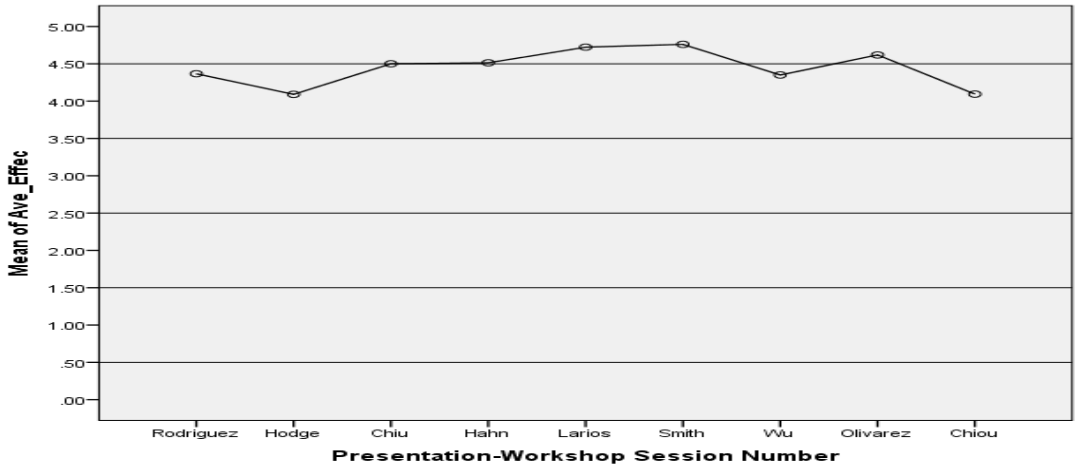
To examine the participants' perceptions as to how closely aligned or relevant to the Green Energy Manufacturing goals, a breakdown across individual seminars and workshops was performed and Table 5 reports on these mean differences among them by reporting number of agreement ratings received means, standard deviations, standard errors, and lower and upper

95% confidence intervals for each scale items. The highest average observed for this subscale was found in session # 6 while the lowest average was detected on session # 2. Not one of the seminar and workshop presentations received a low average overall rating with workshop #4 receiving the lowest but very good ratings. However, the overall averages for almost all of the presentations were not as high as the previous variable on effectiveness.

This was expected given that several presenters were not specifically given instructions to adhere to the goals and objectives of the GEM's grant project to their selected presentations. For example, workshop # 2 delivered by Dr. Olivarez focused primarily on leadership concepts and how leadership can be used to avoid unnecessary risk or problem. Similarly, for workshop # 1, delivered by Dr. Wu. Her presentation emphasized mostly key aspects of agent-based simulation application to health-related situations.

All in all, most presentations and workshops received moderate to high ratings of agreement as these provided a framework for relevancy to the conference general goals and objectives in a way that these focus more on the quality issues. The plotting of these averages is observed on Figure 2.

Figure 2. Depiction of overall level of effectiveness in all presentations



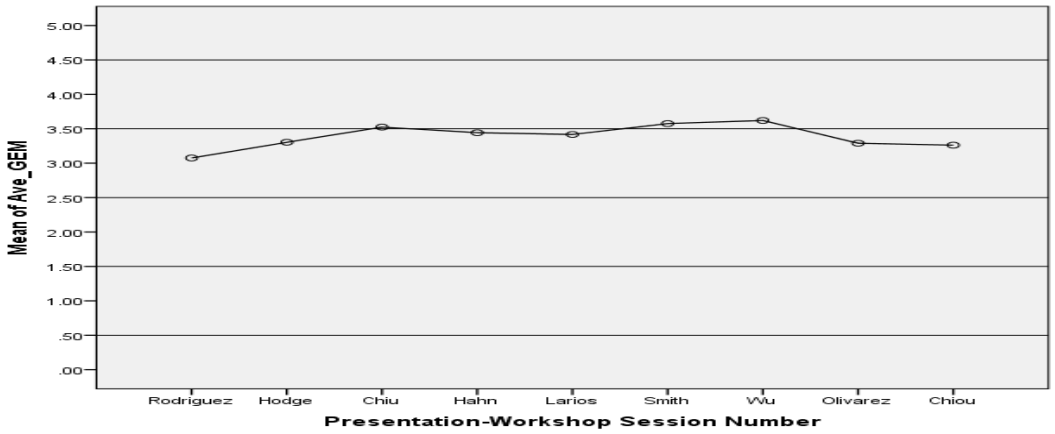
Descriptive statistics of overall organization quality of presentations

Table 5. Descriptive statistics of participants' perceptions about the overall average perception of presentations' effectiveness

Presenters and Sessions-Effectiveness (8-items)	N	M	SD	LB	UB
Session 1	29	4.3664	.99493	3.9879	4.7448
Session 2	29	4.0905	.87493	3.7577	4.4233
Session 3	29	4.5000	.65975	4.2490	4.7510
Session 4	28	4.5134	.42944	4.3469	4.6799
Session 5	23	4.7228	.34327	4.5744	4.8713
Session 6	24	4.7604	.45879	4.5667	4.9541
Workshop 1	10	4.3500	.72361	3.8324	4.8676
Workshop 2	20	4.6188	.44329	4.4113	4.8262
Workshop 3	12	4.0938	1.04191	3.4318	4.7557
Total	204	4.4608	.71737	4.3618	4.5598

To further determine if there were differences between and among the six conference presentations and three workshops, a breakdown across individual presenters was performed and Table 6 reports on these mean differences among them by reporting descriptive statistics including the respective standard errors and confidence intervals.

Figure 3. Depiction of overall level of agreement in all sessions and workshop presentations and adherence to GEM's goals



Examination of these values, indicate that most all presentations received moderate to high ratings values by with three presentations showing lower ratings than the rest but very good standing indicating "agree" to "strongly agree" score rating averages. Figure 3 illustrates these descriptive statistics results graphically. These subscale items are intended to give a glimpse as to how much effort is offered by the presenters in adhering to the GEM's goals, however, the invited speakers have their freedom or flexibility to connect their presentation content to these goals.

Table 6. Descriptive statistics of participants' perceptions about the overall average perception the presentations' adherence to GEM's goals.

Presenters and Sessions-GEM's goals and objectives	N	M	SD	LB	UB
Session 1. Rodriguez	29	3.0759	1.11280	2.6526	3.4991
Session 2: Hodge	29	3.3034	.71438	3.0317	3.5752
Session 3: Chiu	29	3.5241	.68539	3.2634	3.7848
Session 4: Hahn	28	3.4429	.56137	3.2252	3.6605
Session 5: Larios	23	3.4174	.86321	3.0441	3.7907
Session 6: Smith	24	3.5750	.56665	3.3357	3.8143
Workshop 1: Wu	10	3.6200	.50288	3.2603	3.9797
Workshop 2: Olivarez	20	3.2900	1.02695	2.8094	3.7706
Workshop 3: Chiou	13	3.2615	1.00460	2.6545	3.8686
Total	205	3.3776	.81125	3.2658	3.4893

Perceived level of Information received from Presentations

An examination of the participants' level of perceived knowledge and/or awareness as to the presented topic using a chi-square procedure yielded a statistical significant finding across all presentations in this year's conference, [$\chi^2(4) = 27.4$, $p < .001$]. In addition, the contingency coefficient assessing the degree of association between these two variables indicated a significant result ($r = .37$). Follow-up analyses focusing on just the seminars (n = 141) vs. the workshops (n = 34), the results indicated significant associations between prior and posterior perception changes with participant indicating highly significant gains for the invited seminars, [$\chi^2(4) = 20.4$, $p < .001$] while respondents indicated some gains or acquired knowledge due to the workshops [$\chi^2(4) = 13.10$, $p < .01$]. These results indicate that the vast majority of participants perceived as having had a positive new level of content knowledge gained in relation to the presentation and workshop topics covered during the conference. See Table 7.

Table 7. Participants reported gains before and after the different sessions and workshop presentations.

Perceived before and after levels of change in content knowledge acquired for all presentations by respondents			How would you rate your knowledge of the subject matter or topic **after** having attended the presentation session?			
			Knowledge level on topic remained the same	Became somewhat knowledgeable about topic	Become very knowledgeable about topic	Total
How would you rate your knowledge of the subject matter or topic presented **before** to the presentation session?	Not very Knowledgeable about topic	Count	2	46	11	59
		% of Total	1.1%	26.1%	6.3%	33.5%
	Somewhat knowledgeable about topic	Count	2	49	45	96
		% of Total	1.1%	27.8%	25.6%	54.5%
	Very knowledgeable about the topic	Count	0	4	17	21
		% of Total	0.0%	2.3%	9.7%	11.9%
Total		Count	4	99	73	176
		% of Total	2.3%	56.3.%	41.5%	100.0%

Summary of Quality of All Seminars and Workshop Presentations

Two additional follow up open-ended questions on the issue of the value of the presentations yielded also favorable comments about the sessions and workshops while the survey question about the kind of influence that the presentations could have on changing participants' views or behaviors about Green Energy Manufacturing issues reported few but favorable comments by the participants. The participants for any of the presentations generated no other qualitative comments.

As clearly observed from the more than 207 participants' ratings surveys completed, an overwhelming majority of the participants appeared to have rated all nine presentation with high agreement ratings as well as positive levels of perceived gained on knowledge content of the presented topics indicating that presenters adhered to the principles of excellence which are endorsed in the different goals and objectives from the Industrial, Manufacturing, and Systems Engineering Department and their annual the conference. Most of the comments or observations made by participants in reference to overall effectiveness of the conference activities were of logistics in nature (i.e., staying in the allotted time, public speaker system issues, etc.). All in all, there were very few negative observations provided for all of the presentations in the open-ended survey questions.

Perceptions of Effectiveness and Conceptual Knowledge Acquisition from Workshops

Another important component of this annual conference deals with the opportunity afforded to all participants to play a more dynamic role in the acquisition of a new set of skills by their active involvement in the various programmed workshops. These workshops are planned to include cutting-edge methodologies and/or approaches for the solution of various types of situations dealing with the application of soft- and hard-people skills. In efforts to determine the degree of new learning or knowledge acquired by the workshop's participants, individual statistical analyses were performed for each workshop presentation. The use of baseline (pre-test) data before the presentation is compared to data gathered after each presentation workshop (post-test).

Workshop # 1 (Simulation Applications of Health-Care System Efficiency Models)

Professor from Arizona State University conducted a very interactive hands-on set of instructional and learning activities in her presentation about the application of efficiency models to reduce access to health-care. Her workshop covered some of the basics of simulation and agent-based simulation by demonstrating the basics and various implementation aspects of Netlogo® as a simulation computer tool. Dr. X demonstrated the application of the software to implement within a healthcare system. The general idea as to how to implement the software application was presented and participants downloaded the Netlogo® software and the test-case setup and learned how to develop the simulation model and setup the parameters for a selected healthcare system. Some of the agents of interest within this software application included exercises such as MR exams in a radiology department, the various steps in creating the agent, and a demonstration of the process for assisting patients. The participants in this workshop learned about the fundamentals of agent-based simulation and healthcare systems by attempting various simulation models for a Mayo clinic. This presentation was well received by the participants and received one the highest scores in terms of overall perception of presentation quality subscale score ($M = 4.37$, $SD = 0.65$) in meeting the varied criteria for any presentation workshop in the conference. Additionally, the students were exposed to a number of new set of computer simulation concepts through a practical approach using computer software for several

simulation exercises or agents. A few other selected evaluation items on the quality of the presentation indicated that this workshop session was well organized (M = 4.35, SD = 0.72). Of interest, the respondents evaluated this presenter a bit low (M = 3.62, SD = 0.50) on the issue of such workshop presentation having effectively addressed the GEM's program's goals and objectives. Table 8 provides a general description of the selected 5 items and subscale totals describe the participant's rating on the presenters' ability to deliver the content of their presentations well.

Table 8. Descriptive statistics on selected evaluation items and subscale totals for workshop #1

Evaluation Statements	N	M	SD
i14=Overall organization of this presentation session	10	4.30	1.25
i15=Overall rating of this presentation	10	4.40	0.84
Overall average perception of presenter's effectiveness	10	4.35	0.72
Overall average perception of presenters' addressing GEM goals	10	3.62	0.50
Overall average perception of presentation quality total scale	10	4.37	0.65
Valid N	10		

Assessment of Participants' Performance in Knowledge Test

For this year, a modified knowledge pre- and post-tests were developed for this session and these were administered to the participants with only 4 participants completing both tests. Overall descriptive statistics are presented as to how students were able to perform before and after the presentation of this workshop. The participants' (n =14) performance on the pre-test knowledge test yielded an average score of 61 while the average score for the post-test performance was 64 in a scale of 1 to 100. The comparison between pre-and post-test performances was found to be non-statistically significant between the baseline data points and the post-test administration [$t(13) = 0.69$, $\underline{p} > 0.05$]. The participating students who chose to complete the post-test exam appear not to have been able to make the appropriate connections between the content of the presentation and the exam items. There is also the need to improve the administration of these assessments at the beginning and end of the presentation.

Workshop # 2 (Learning to Lead as a Way to Solve Problems and Avoid Crises in the Workplace: The Role of Engineers)

Professor from the College of Education at the University of Texas at El Paso presented general concepts of leadership and the type of role that engineers can or should play. The importance of not waiting for the leadership skills to be learned in the workplace is emphasized as a way to confront the many obstacles and challenges by being prepared way before these incidents occur. The presentation provided with an overview of the current leadership crises and the competencies required to be an effective leader and how these competencies are directly related to engineering education training. He was able to present various leadership skills and dispositions needed to succeed at any job market. A good percentage of the attendees indicated having acquired new set of knowledge concepts and skills and this presentation received also high levels of agreement scores in terms of overall quality (M = 4.70, SD = 0.45) in meeting the

revised evaluation survey's quality criteria for any of the presentation workshop. As before, a few selected evaluation items on the quality of this presentation indicated that this workshop session was well organized (M = 4.62, SD = 0.50) and the overall rating for this session was very good (M = 4.76, SD = 0.44). There were 20 respondents indicating that they felt as having learned a new set of concept in this area of twenty-first century leadership competencies for engineers. The respondents also indicated that the presenter did a very good job in communicating the myriad of leadership competencies and theories that one needs to be prepare when crises arise. As before, the respondents felt that the presentation did not quite addressed the GEM's program's goals and objectives (M =3.29, SD = 1.02). Table 9 provides a general description of the selected 2 items and subscale total scores which describe the participant's rating on the presenters' ability to deliver the content of their presentations effectively. As in the previous workshops, the students were exposed to a large number of new concepts and ideas on the current theories on leadership and the multitude of competencies that are typically found in a good leader. Some of the general verbal comments obtained from the audience included aspects of opening the session to more interactive activities with the students and to allow some section for more questions and answers section.

Table 9. Descriptive statistics on selected evaluation items and subscales for workshop #2

Evaluation Statements	N	M	SD
i14=Overall organization of this presentation session	21	4.62	0.50
i15=Overall rating of this presentation	21	4.76	0.44
Overall average perception of presenter's effectiveness	20	4.62	0.44
Overall average perception of presenters' addressing GEM goals	20	3.29	1.02
Overall average perception of presentation quality	20	4.28	0.69
Valid N	20		

Assessment of Participants' Performance in Knowledge Test

The participants' performance on the post-test knowledge test was found to be statistically non-significant between the baseline data points and the post-test administration [t(13) =0.65, p = .45]. The mean difference from zero was only of two points, on average. As in the previous workshop findings, the students who chose to complete the post-test exam were not been able to make the appropriate links between the content of this presentation and the post-test items. The test-retest reliability for this tests was (r =.66) but not as high as typically expected for this type of content knowledge assessment and its short span of time between testing situations. Most of these results may be linked to the small sample size that provided complete and valid results (n = 14). Overall, the quiz did not seem to produce large differences in gain scores between pre- and post-test performances. This may be due to some pressing factors such as the pressure to finish the task due to the next or upcoming presentation and the set up required for its delivery.

Workshop # 3 (Internet of Things (IoT) in Green Energy Manufacturing)

This final workshop presentation had a main goal of delivering an overview of the internet of things as these apply to Green Energy Manufacturing (GEM). His presentation alluded to the ongoing uses of IoT as these relate to GEM situations and contexts. The workshop provided students with a firm grounding in the principles of sustainable manufacturing environment and real-world energy efficiency improvements on general systems.
The presenter (Dr. **X**) indicated IoT is a growing area in the field of engineering and its aimed at reducing human effort. He also emphasized, while IoT may have tremendous applications in engineering, its potential in the field of green energy manufacturing is often neglected." The overall respondent attitude ratings obtained were in the range of "agree" to "strongly agree". The overall rating with the revised evaluation scale was close to a 4 rating or "agreement" levels, (M = 4.25, SD = 0.87). As before, Dr. X exposed the students to a large number of new concepts and interactive approach on posing question throughout the presentation of new concepts. Again, a few selected evaluation items on the quality of the presentation indicated that this workshop session was satisfactorily organized with one of the highest scores observed (M = 4.04, SD = 1.04) and the overall rating for this session was adequately good to very good (M = 4.08, SD = 0.83). A total of 26 valid participant's ratings were received for this presentation. The respondents indicated also that the presenter did a good job on addressing the GEM's program's goals and objectives (M = 4.22, SD = 0.87) while respondents expressed in their ratings some level of satisfaction with the presenter's style for communicating the content. Table 10 provides a description of the selected 5 items and subscale scores, which describe the participant's rating on the presenters' ability to deliver the content of their presentations well.

Table 10. Descriptive statistics on selected evaluation items for workshop # 5

Evaluation Statements	N	M	SD
i14=Overall organization of this presentation session	12	4.00	1.21
i15=Overall rating of this presentation	12	4.25	0.87
Overall average perception of presenter's effectiveness	12	4.09	1.04
Overall average perception of presenters' addressing GEM goals	12	3.26	1.00
Overall average perception of presentation quality	12	3.97	1.11
Valid N	12		

Assessment of Participants' Performance in Knowledge Test

A total of 18 different participants were in attendance and reported having taken either the pre-test (n = 13) or the post-test (n = 10). However, only 8 students manage to complete both quizzes for this presentation. As in previous workshop sessions, the participants had only a limited amount of time to acquire and apply the numerous new concepts presented by Professor X. These participants provided valid data that produced results on the knowledge exam (pre- and post-tests) to be statistically non-significant [t(7 = 1.06, p = 0.37]. The mean difference for this workshop presentation was found to increase slightly from pre-test to post-test. Although, there were only 13 recorded data pieces between the pre-test and the post-test points, only 8 participants provided valid data for both test administrations. The overall gain scores for these

participants in this workshop yielded a mean of less than one and one-half point difference with a standard deviation of 1.39 points. The overall correlation index for these test administration was r = 0. 75, which is considered adequate even though the pretest and posttest were basically the same and administered within a very short span of time between test administrations, may have produced some carry-over-effects.

Reflection

Upon examination of the participants' performance for this particular event, it was noted that a good number of students took the time to complete the pre-test and post-test quizzes but the gained scores outcome did not reported any practical or statistical improvements in general knowledge gains. As in previous conferences, an overview of these presentation content indicated that there were too many MS Powerpoint slides spread across 3 or 4 somewhat inter-related topics and concepts for these presenters which causes programing of sessions problems due to the continuous overlapping of sessions. Overall, the large amount of material presented and the different levels, majors, or groups who participated during the workshop session appeared to be relevant and pertinent to the participants' needs, this indicated that various important concepts were captured and well-received; however, there may be still a need for a more structured curriculum that allows students to the better acquisition of the content. Even though, there was not statistical significance the participants were able to produce more than 2 point gains between pre-test and post-test administrations. As in previous workshop presentations, there is a need to improve the degree of relationship that exist between exam measures to make them more relevant to the concepts presented in their intent to assess students' level of concept acquisition.

Overall Observations and Recommendations for the Workshop Presentations

The planning committee took it upon itself to make the necessary modifications and updates to the current program so that previous mishaps could be corrected. For this year's conference, several needed changes were implemented in the area of number of invited sessions and number of manageable workshops. The idea here was to provide more time for the workshops so that presenter and attendees could interact as much as possible during these sessions. In addition, this extended times for the workshops would allow for the appropriate administration of the evaluation survey and knowledge assessments. The organization and implementation of this annual conference appears to continue to be a successful event given that larger number of participants were able to attend. Not just to one or two but several of the presentations throughout the day. Approximately of 49 different participants were able to provide their views and perceptions as to the quality of the workshop presentations with and overall total of 207 ratings received by this group of participants on all invited sessions and workshops. Of the 12 items found in the revised evaluation rating scale, the majority of the evaluative criteria received "agree" to "strongly agree" ratings by the student participants with an overall organization and presentation effectiveness mean rating of 4.45 (0.92) in a scale of 1 to 5 with high indicating that participant tended to "strongly agree" with many of the evaluation items. The two-day symposium set of workshops attracted a good number of graduate and undergraduate students with a larger representation derived from the upper classman undergraduate level group and those from the industrial engineering major or concentration. Like previous conference presentation, the qualitative open-ended questions elicited similar comments and observations as indicating that the participants were satisfied or had acquired some new "knowledge",

dispositions, and “skills” but these verbal comments were very few and sparse across the different workshop presentations. Even though, the content knowledge quizzes were adapted to the particular workshop presentation, revised and re-edited, there is still a need to continue refining the various content knowledge exams administered for each of the presentations by reviewing their individual psychometric properties which allow for more solid and defensible set of data results and conclusions. The director and organizers of the symposium should be congratulated in providing the means and support for student success in this important area of study. The overall assessment is that this conference was a complete success and of great benefit to its participants.

References

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Appendix A

Quality of Presentation Evaluation Scale

Green Energy Manufacturing (GEM) Project

Invited Session or Workshop: Evaluation Scale

Workshop Title: _____

Presenter:_____ Date: April 21, 2016

Instructions: In efforts to provide the best learning experiences through this workshop series, provide your candid and truthful appraisal of this presentation by rating the following statements of the workshop using the following five-point scale values, circle your perceived level of agreement level:

1 = Strongly Disagree
2 = Disagree
3 = Neutral (Neither agree or disagree)
4 = Agree
5 = Strongly Agree
NA= Not Applicable or I do not know

	Statements	1	2	3	4	5	NA
1.	Presentation clarified most topic/objectives of workshop	1	2	3	4	5	NA
2.	Presentation content/information was made easy to understand	1	2	3	4	5	NA
3.	Presentation related topic to various *GEM* project's goals and objectives	1	2	3	4	5	NA
4.	Presentation topic help apply theory to solve problems in *GEM* or related disciplines	1	2	3	4	5	NA
5.	Presentation facilitated in my development of new set of skills	1	2	3	4	5	NA
6.	Presentation aided in my understanding of new concepts in my major	1	2	3	4	5	NA
7.	Presenter's delivery and strategies linked well to *GEM* project	1	2	3	4	5	NA
8.	Presenter's overall comprehensive knowledge of topic presented was clearly demonstrated	1	2	3	4	5	NA
9.	Presenter's style of communicating topic information was very efficient	1	2	3	4	5	NA
10.	Presenter's response to questions/queries by audience was accurate	1	2	3	4	5	NA
11.	Presenter's effectiveness in conveying topic concepts was excellent	1	2	3	4	5	NA
12.	Presenter's material, case study application, or handouts during workshop	1	2	3	4	5	NA
13.	Presentation met *GEM*'s program goals and objectives	1	2	3	4	5	NA
14.	Overall organization of this workshop session was excellent	1	2	3	4	5	NA
15.	Overall intrinsic value of this workshop session was high	1	2	3	4	5	NA

Additional items/questions on next page

How would you rate **your** knowledge of the subject matter or topic presented **prior** to the workshop? (Check one)

_____Not very knowledgeable about the topic(s)
_____Somewhat knowledgeable about the topic(s)
_____Very knowledgeable about the topic(s)

How would you rate **your** knowledge of the subject matter or topic **after** having attended this workshop session? Check one)
_____Remained not very knowledgeable about the topic(s)
_____Turned somewhat knowledgeable about the topic(s)
_____Became very knowledgeable about the topic(s)

Please provide your opinion on the following open-ended statements concerning this presentation.

What was the most valuable aspect(s) of this workshop on *Simulation Application for Healthcare efficiency?* Please explain._____
_____
_____
_____
_____
_____

Additional comments or suggestions about this workshop. _____
_____
_____
_____

Demographics: Circle or complete.

Gender: Male Female

Highest Degree: Bachelors Master's Doctoral

Undergraduate Classification: Freshman Sophomore Junior Senior

Graduate Level: 1st Year Master's 2nd Year Master's 3rd Year Master's

Doctoral Level 1st Year Doc. 2nd Year Doc. 3rd Year Doc. 4th Year Doc. >4th Years

Current Concentration/Major Area:_____

Appendix B
Knowledge Quiz (Pre- and Post-test)
Simulation Applications for Healthcare Efficiency

Workshop #1 Knowledge Quiz **Student (Use last 3 digits of student ID) #** _____

For the following closed-ended multiple choice questions, select the answer or choice that best reflect the stimulus question or statement. Circle your choice.

1. According to the Clinical Advisory Board 2005 Report to member executives the two largest industries that reported high levels of error rate included:
    a. Hotel and Airline industries
    b. Health services and US Postal Service industries
    c. Retail Banking and Telecommunication industries
    d. Heath services and Retail Banking
2. One of the biggest hurdles to the whole operation in health care deals primarily with this issue
    a. Patient information is stored in disparate data sources and in non-standardized formats
    b. Patient information is stored in incongruent data sources but in typical standardized formats
    c. Patient information is stored in commonly known sources but in non-standardized formats
    d. Patient information is stored in ordinary known sources but in typical standardized formats
3. What does DDD stand for in issues of health informatics and quality-assured health care operations?
    a. Devises Data Depot
    b. Department Data Depot
    c. Department Data Delivery
    d. Devises Data Delivery
4. One of the most important benefits and purposes of agent-based modeling and simulation (ABMS is
    a. Difficult to introduce any type of control in a system's environment
    b. Difficult to predict system performance in the real world due to local action
    c. Predicts or models a system misbehavior and deficits with high degree of accuracy
    d. Predicts or models a system behavior performance as determine by local action and interaction
5. The key difference between Agent-Based Modeling (ABM) and Agent-Based Modeling and Simulation (ABMS) is
    a. An approach to model and simulate complex adaptive systems
    b. An approach to model and simulate complex systems by local action about the agents
    c. An approach to model and simulate complex systems by local action and interaction within an environment.
    d. An approach to model complex adaptive systems by local action about the environment
6. The difference between a deterministic model and a stochastic model is
    a. Inputs and parameters are well behaved rather than erratic
    b. Inputs and parameters are random rather than nonrandom
    c. Inputs and parameters are probabilistic and discrete
    d. Inputs and parameters are deterministic and continuous
7. One characteristic of a discrete v. continuous event simulation models is that it is an
    a. Inferential models which helps us make inductive decisions
    b. Minimization model which leads to smaller errors in the system
    c. Optimization model that provides the best solution in a system
    d. Descriptive model as to how a system behaves
8. What exactly is the NetLogo model simulation software all about?
    a. A free-agent tool which studies the environment through simulation modeling
    b. A free-agent oriented programmable tool use for modeling real life simulations
    c. Free agent-based simulation environment modeling tool based on Logo and LISP languages
    d. Free agent-based simulation environment modeling tool based at Northwestern

Learning to Lead

Workshop # 2 Knowledge Quiz **Student ID#_____ (Use last 3 digits of UTEP's ID)**

For the following closed-ended multiple choice questions, select the answer or choice that best reflect the stimulus question or statement. Circle your choice.

1. This theory of leadership emphasize that leaders select a course of action based upon contextual or situational variable(s).
    a. Contingency Leadership theory
    b. Great Man Leadership theory
    c. Transformational Leadership theory
    d. Situational Leadership theory
2. What is it meant when it is said that leadership is developed … not discovered?
    a. In order for me to become a leader, I must work real hard at getting good people skills
    b. In order for me to become a leader, I must work real hard at building relationships
    c. If I want to become a leader, I must be willing to equip myself with the necessary competencies daily.
    d. If I want to become a leader, I must be willing to sacrifice family and personal interests and freedoms.
3. Another name for what this leadership theory which emphasizes connections or relationships are formed between leaders and followers
    a. Transformational Leadership theory
    b. Transactional Leadership theory
    c. Contingency Leadership theory
    d. Behavioral Leadership theory
4. One of the facts about the role of leaders and leadership in general has to do with the reality that
    a. Leadership is inherited not developed
    b. Leadership is developed and it can be acquired by everyone
    c. Leadership is developed not discovered
    d. Leadership is all about how much knowledge you have and who you know
5. According to John Maxwell, there are seven building blocks to leadership development, which three are correct blocks?
    a. Influence, Integrity, Ambition, Change
    b. Influence, Change, Mission, People
    c. Influence, Priorities, Self-discipline, Vision
    d. Influence, Integrity, Vision, Mission
6. One of the most important key concepts or principles in leadership development beyond influence
    a. The Priority principle
    b. The People friendly principle
    c. The Profit oriented principle
    d. The Cost and/or Waste minimizer principle
7. What are three detrimental hindrances that any leader can exhibit and will work against personal and company goals
    a. Inflexible, insecure, organized
    b. Insecure and defensive, passing the buck, and no team spirit
    c. No people skills, lack of imagination, pro change
    d. Passing the buck, flying into rages, confident
8. What are three of the ingredients for effecting positive change in a team or company by the leader?
    a. Develop trust, Lead by example, Create ownership
    b. Develop trust, Dictate guidelines, take most of the credit
    c. Understand the organization, solicit support from others, emphasize outcome
    d. Lead by example, emphasize benefits, take most of the credit
9. List three key aspects of a good leadership development vision
    a. Credibility, Acceptance, Assessment
    b. Value, Acceptance, Credibility
    c. Success, Acceptance, and Achievement
    d. Value, Evaluation, Milestone

Internet of Things (IoT) in Green Energy Manufacturing

Workshop # 3: *Pre-Test* Knowledge Quiz Student ID#_____ (Use last 3 digits of UTEP's ID)

For the following closed-ended multiple choice questions, select the answer or choice that best reflect the stimulus question or statement. Circle your choice.

1. What is considered as one of the first examples of network of smart devices? What, when, and where?
    e. Car assembly, 1945, MIT
    f. Mail delivery, 1989, US Postal Service
    g. Coke machines, 1982, Carnegie Mellon
    h. Computer hardware, 1999, IBM systems
2. One of the major objectives for IoT deal primarily with?
    a. The implementation of computer chips to speed up repetitive and menial process
    b. The equipping of commonly used objects with machine-readable identifying devices
    c. The implementation of connectivity devices for economic analysis
    d. The creation of smart environments or spaces and the self-awareness of things such as smart living
3. What are some of the current global challenges addressed by an IoT application?
    a. Energy efficiency, environmental protection, greenhouse emissions reduction
    b. Blackhouse emissions controls, environmental protection, public health
    c. U.S. Administration emanation policies, public health, public safety
    d. U.S. Congress policies on the environment, business growth, public health
4. What are some of the IoT research application to energy?
    a) Environmental monitoring, transportation, and economic forecasting
    b) Media, Infrastructure management, Manufacturing, and Transportation
    c) Industrial use, Media, small scale deployments
    d) Infrastructure management, residential and personal monitoring, healthcare monitoring
5. In the context of IoT, what do we mean by Logistics?
    a. A process of planning and controlling the flow of traffic during heavy congestions periods
    b. A procedure for using agent based software like NetLogo from conception to consumption
    c. A process of planning, implementing and controlling the efficient and cost-effective flow of materials
    d. Industrial and Commercial processes that allows for the minimization of waste
6. In the context of IoT, what do we mean by Reverse Logistics?
    a. A process of planning that allows for the evaluation of efficiency and cost-effective measures
    b. A process for implementing and controlling the flow of material by the recapture of value and disposal
    c. A process for looking at the flow of traffic from a new perspective of lag time and leisure
    d. A process of planning and controlling the efficient flow of material and information from end-point to starting-point
7. Included in the reverse logistics process, a typical merchandise return path would involve at the origin point
    a. Recover, remarket, recycle, and reuse
    b. Manufacture, ship, deliver, and consume
    c. Reinvent, repackage, recycle and retain
    d. Produce, inspect, deliver, and market
8. What is it meant when we talk about "Life Cycle Thinking?
    a. The development of a concept, identifying a demand, and creating a marketing plan
    b. The process of supply, demand, delivery, retail, and consumption
    c. The process of recycling, use retailing, manufacturing, and concept development.
    d. The development of a concept, manufacturing, delivery, retail, use, disposal, and recycling
9. What are three benefits of green logistics and reverse logistics?
    a. Zero defects, zero breakdowns, and zero accidents
    b. Increase revenue, reduce waste, and reduced community impacts
    c. Reduce cost, decrease assets, and enhance customer experience and service
    d. Reduce fuel costs, reduce air/water emissions, increase energy efficiency
10. What are some common advantages of IoT technologies such as WiFi IEEE, Barcodes, smartphones, etc?
    a) Very common, general purpose, various operation systems
    b) Easy to deploy, low cost, multiple network typologies
    c) Easy to use, low cost, can be use globally

d) Easy to use, multiple operating systems, very secured

11. What is the future of the barcode technology integrated with IoT?
    a. It will continue to be easy to be scan by different readers
    b. It will continue to be used as a tracking mechanism for consumer preferences
    c. It will be continue to allow customers to access additional information about their neighbors
    d. It will incorporate access to additional information for the consumer about the product by scanning the package.

Appendix C

Table 13. Principal component analysis with varimax rotation for the total evaluation scale using all presentations (n = 207)

	Component		
Evaluation Scale Statements	1	2	3
i8=Presenter's comprehensive knowledge of topic presented	**.803**	.305	.042
i2=Presentation covered topic content or information	**.779**	.322	.121
i1=Presentation clarified key objectives	**.733**	.110	.302
i6=Presentation aided in the understanding of new concepts	**.702**	.312	.242
i9=Presenter's style of communicating information	**.692**	.317	.151
i11=Presenter's effectiveness in conveying topic concepts and ideas	**.677**	.128	.216
i15=Overall rating of this presentation	**.654**	.064	.572
i5=Presentation facilitated to develop new set of skills	**.577**	.359	.196
i3=Presentation related topic to various GEM project's challenges	.255	**.864**	.227
i7=Presenter's delivery strategies linked to GEM	.342	**.850**	.222
i4=Presentation topic help apply theory to solve problems in GEM	.364	**.834**	.115
i13=Presentation met some of the GEM's program goals and objectives	.171	**.801**	.406
i12=Presenter's material or handouts during workshop	.234	.263	**.758**
i10=Presenter's response to questions/queries by audience	.084	.285	**.691**
i14=Overall organization of this presentation session	.493	.153	**.623**
Eigenvalues	7.85	1.56	1.08
Cronbach's Alpha reliabilities	0.90	0.91	0.92
Variance Explained	52.33	10.39	7.18

Note. Three major distinct subscales emerged. One of the scales appear to focus heavily on aspects of overall effectiveness and perceived quality of all presentations while the other subscale appears to indicate and assess aspects of the presentation dealing with coverage or applicability of concepts to Green Manufacturing Energy goals. Three items appear to play multiple roles with one of them not necessarily a relevant item for these presentations (i12). Items 5 and 14 appear to have dual applicability from the student's perspectives while item 10 appears to be of some relevance but not to all presentations in the conference. The three extracted subscales yielded correlations higher than .43 indicating a high commonality aspects assessed by the scale. About 70 percent of the total variance was explained by these components. Removal of these items yielded a slightly different component structure of the total scale with two major components extracted and the results are presented next.

Table 14. Principal component analysis with varimax rotation for the evaluation scale using 12 items from all presentations (n = 207)

Evaluation Scale Statements	Component 1	Component 2
i15=Overall rating of this presentation	**.802**	.176
i1=Presentation clarified key objectives	**.783**	.177
i2=Presentation covered topic content or information	**.755**	.337
i8=Presenter's comprehensive knowledge of topic presented	**.751**	.304
i6=Presentation aided in the understanding of new concepts	**.724**	.340
i11=Presenter's effectiveness in conveying topic concepts and ideas	**.698**	.162
i9=Presenter's style of communicating information	**.682**	.333
i14=Overall organization of this presentation session	**.665**	.279
i5=Presentation facilitated to develop new set of skills	.588	**.377**
i3=Presentation related topic to various GEM project's challenges	.263	**.897**
i7=Presenter's delivery strategies linked to GEM	.344	**.881**
i13=Presentation met some of the GEM's program goals and objectives	.246	**.861**
i4=Presentation topic help apply theory to solve problems in GEM	.329	**.848**
Eigenvalues	7.25	1.55
Variance Explained	55.77	11.88

Note: The elimination of these two non-relevant items produced similar results in the composition and membership of the individual items for each component. The items on the first component appear to address issues of effectiveness and overall quality for the presentation itself and the presenter while component two the composition of the various items indicates various aspects dealing with GEM goals and objects and how these were being addressed in these presentations. About 70 percent of the total variance was explained by these two components.