ISSN: 1545-679X

Information Systems Education Journal

Volume 8, Number 58 http://isedj.org/8/58/ July 26, 2010

In this issue:

Computer Literacy and Non-IS majors

Jennifer D.E. Thomas
Pace University
New York, NY 10038 USA

Martina Blackwood
Pace University
New York, NY 10038 USA

Abstract: This paper presents an investigation of non-Information Systems (IS) major's perceptions and performance when enrolled in a required introductory Computer Information Systems course. Students of various academic backgrounds were taught Excel, Hypertext Markup Language (HTML), JavaScript and computer literacy in a 14-week introductory course, in the context of what are called 'learning pods'. In the perceptions study, students answered a survey about their perception of the technologies and assignments used throughout the semester, as they contributed to various learning and team-building skills. The second study examined student performance through a series of pre- and post- quizzes. Results from the two studies indicate that students' perceptions and performance were impacted favorably.

Keywords: technology integration, non-Information Systems majors, computer literacy, higher-order learning skills, team-building skills, learning pods

---

Recommended Citation: Thomas and Blackwood (2010). Computer Literacy and Non-IS majors. *Information Systems Education Journal, 8* (58). http://isedj.org/8/58/. ISSN: 1545-679X. (A preliminary version appears in *The Proceedings of ISECON 2009:* §3753. ISSN: 1542-7382.)

This issue is on the Internet at **http://isedj.org/8/58/**

The **Information Systems Education Journal** (ISEDJ) is a peer-reviewed academic journal published by the Education Special Interest Group (EDSIG) of the Association of Information Technology Professionals (AITP, Chicago, Illinois). • ISSN: 1545-679X. • First issue: 8 Sep 2003. • Title: Information Systems Education Journal. Variants: IS Education Journal; ISEDJ. • Physical format: online. • Publishing frequency: irregular; as each article is approved, it is published immediately and constitutes a complete separate issue of the current volume. • Single issue price: free. • Subscription address: subscribe@isedj.org. • Subscription price: free. • Electronic access: http://isedj.org/ • Contact person: Don Colton (editor@isedj.org)

This paper was in the 2009 cohort from which the top 45% were accepted for journal publication. Acceptance is competitive based on at least three double-blind peer reviews plus additional single-blind reviews by the review board and editors to assess final manuscript quality including the importance of what was said and the clarity of presentation.

Computer Literacy and Non-IS majors

Jennifer D.E. Thomas
jthomas@pace.edu

Martina Blackwood
mblackwood@pace.edu

Pace University
1 Pace Plaza
New York, New York 10038 USA

Abstract

This paper presents an investigation of non-Information Systems (IS) major's perceptions and performance when enrolled in a required introductory Computer Information Systems course. Students of various academic backgrounds were taught Excel, Hypertext Markup Language (HTML), JavaScript and computer literacy in a 14-week introductory course, in the context of what are called 'learning pods'. In the perceptions study, students answered a survey about their perception of the technologies and assignments used throughout the semester, as they contributed to various learning and team-building skills. The second study examined student performance through a series of pre- and post- quizzes. Results from the two studies indicate that students' perceptions and performance were impacted favorably.

Keywords: technology integration, non-Information Systems majors, computer literacy, higher-order learning skills, team-building skills, learning pods

1. INTRODUCTION

Technology is present in nearly every facet of our lives, so it is imperative that students receive a solid foundation in computer literacy. Pace University offers Computer Information Systems 101, an introductory computer course, which must be taken by all students who plan on graduating from the institution. Pace University offers several variations of this course each semester but training in Excel, HTML, JavaScript and computer management remain the core objectives in each section. CIS 101 is designed to enrich the technological skill set of the student body despite their academic major. This course will normally find instant appeal among those who plan on declaring a major or minor in some area of technology. However, the vast majority of the students who take this course have no direct academic connections to technology, so their level of interest in the topic is decidedly lower. The desire to capture the attention and interest of non- Information Systems (IS) majors is of chief concern to all who teach this unique course. Understanding the perspective and challenges of the non-majors will assist instructors in presenting the material to the students in a more appealing way.

It was from this perspective that the course was re-designed to deliver this content within the context of what are called 'learning pods', or focused technology-related topics. A learning pod is a technology related theme that is used to provide students with a context in which they can better understand computing. Use was also made of technologies, such as PowerPoint, Blackboard content management system, and YouTube videos. The YouTube videos were selected by the Information Systems department and each video was made available through the Blackboard system. The videos addressed specific concepts covered during the class lecture. Students were encouraged to watch the videos to enhance their understanding of the course material.

Two separate studies were conducted to explore the effect this approach had on student performance and perceptions. The aim was not to compare student perceptions in one

study to student's performance in the other study but, rather, the purpose was to gain general insight into student responses to learning in the context of learning pods.

Results from the performance study indicate that improvements from pre- to post-tests were gained. Similarly, the perception study also produced positive perceptions with respect to the contributions made to the student's learning skills.

2. BACKGROUND

Researchers have long noted that non-majors taking an introductory computer course will face unique challenges, which will likely factor into their perception of the course. For non-majors, learning a programming language can be an arduous task because each language features specific semantic and syntactical rules. Feelings of frustration may quickly mount as non-majors spend much time and effort attempting to grasp the syntactical and semantically correct structure of a language, only to produce a small amount of output (Bishop-Clark, Courte, Evans and Howard, 2007). An introductory computing course is generally a non-major's first glimpse into the computing world, so their impression of the computing field will be formed largely based on their experience. If the overall impression of the course is negative, students usually make a decision to completely avoid a computing major (Bishop-Clark, Courte and Howard, 2006).

Despite the challenges that an instructor may encounter in teaching non-majors a programming language, studies have shown that non-majors can find success and enjoyment in their technology-based courses. A study was conducted from 2005-2006 of 154 students, the majority of whom were non-majors, enrolled in an introductory computer programming class. Researchers Bishop-Clark, Courte, Evans and Howard, (2006) were able to establish that by using Alice, a computer programming environment, non-majors were able to significantly increase their confidence, enjoyment and achievement in that course. This should help us to appreciate that the technologies and teaching methodology employed in the classroom can have a positive impact on the programming experience of non-majors.

In most university classrooms, our student body consists of students who have had more exposure to Internet-based technologies and digital media than their university predecessors (Guo, Dobson and Petrina, 2008). As a result, instructors have sought out various ways of teaching students by using technologies that move beyond the static blackboard and chalk method of years past. However, when instructors use technologies in their instruction of non-majors, they would not want to use technologies that would be difficult for the students to understand or operate. Using advanced applications could further alienate students and make them less receptive toward the actual course content. Many students already enter computing classes with the perception that computer science and similar courses are significantly more difficult than other academic majors (Kurkovsky, 2007). To successfully train students in a computer literacy course, it would be wise to use teaching technologies that are not completely foreign to the students.

Although our young students may have technology infused into nearly every waking moment of their lives, instructors should not assume that non-majors will automatically become acclimated to an academic environment where new technologies are being used or taught in the classroom. Some faculty may incorrectly perceive the technology-based knowledge of their students to be higher than it actually is, thereby alienating students who have not reached the perceived level of tech competency (Messineo and DeOllos, 2005). When 233 students from a Midwestern university were asked if they would feel comfortable with their course content residing online, a clear majority of 80% of the students felt comfortable with that arrangement (Messineo and DeOllos, 2005). Nevertheless, the study further showed that there was a difference in the student's comfort level when dealing with their personal technology applications when compared to their comfort level in using similar school-based applications such as email. Students were less confident in using advanced tools that reached beyond the standard technologies that they would encounter in their personal lives.

Despite their lack of confidence in using advanced tools, tools such as PowerPoint and Blackboard were clearly acceptable teaching technologies for the non-majors. Both PowerPoint and Blackboard have become viable instruments in training students of various academic backgrounds and it has also

proven successful when training non- Information Systems majors. One study revealed that 98% of the students who participated in the study were comfortable with PowerPoint and 84% had been exposed to Blackboard as a part of their course instruction. The criminal justice students who participated in this study had the perceived notion that their learning was enhanced because of the incorporation of the aforementioned technologies. Instructors who incorporate PowerPoint and make use of videos in classroom instruction have really helped their students to pay more rapt attention during lectures. PowerPoint has also been an aid to students who can be classified as visual learners (D'Angelo and Woosley, 2007).

3. THE STUDY

Armed with the above knowledge, two studies were conducted at Pace University in two separate sections of the Computer Information System 101 course. Two different instructors taught the two sections during the spring 2008 semester. The purpose of the two studies was to gain insights into student perceptions and student performance, not to compare the effectiveness of one teaching methodology over the other or one section against the other. The two studies were of an exploratory nature, given the small sample sizes, and given that it would not have been possible to easily control the differentiating factors that different instructors bring.

The first study measured the perception of non-majors taking the course, with respect to support of team-building skills and higher-order learning skills by the various resources and activities of the course. The second study focused on the academic performance of students when instructors used basic technologies to instruct them in Excel, HTML, JavaScript and computer literacy. Both studies made use of PowerPoint, Blackboard and content-related videos, which were made available through Blackboard to all of the students enrolled in the courses. For both sections, students had access to lecture notes presented through PowerPoint and weekly course related discussions were held through the discussion board section of Blackboard.

Both studies sought to explore the response of non-IS major students to learning technologies in a required computer literacy course, which was situated in the context of what are called 'learning pods'. These learning pods are designed to provide context and application for the learning of these technologies, with the hope of making learning more meaningful. The students in the perceptions study were part of the 'social responsibility' learning pod while the students in the performance study were in a 'computer forensics' learning pod. Other learning pod themes include 'downtown New York' and 'computers and environmental science'. Non-majors often face difficulties in mastering the main course concepts (Bergin and Reilly, 2006). Non-computer science majors involved in a different perception-based study at another university showed that students entering the introductory course did not have a clear indication of what computer science entailed and what they expected to learn from the course. Instructors would want to take this general student perception into account when presenting the material throughout the semester to non-majors. A key ingredient in training non-majors is helping them to make connections between their experiences with computers and the concepts that they are taught in the course (Kurkovsky, 2007).

The perception-based course required students to learn new technologies, such as Excel spreadsheets and HTML code and JavaScript for website development. They also read articles related to social responsibility and were required, as part of a team, to develop a website addressing an issue on this topic. Students generally enter such courses with the idea that the material they will be presented with is difficult to grasp. Although programming can be a daunting task for non-majors, studies have shown that programming in pairs was connected to increased enjoyment of the students. Although not significant, research has also shown that those programming with others reported increased confidence (Bishop-Clark, Courte and Howard, 2006). Increasing the confidence of our non-majors will surely help them to have a more positive outlook on their ability to succeed in the course. Students in the study were also helped through in-class illustrations and exercises to make deeper learning connections with the course content.

The second study focused on the student's performance by examining their pre- and post- test quiz results. The frequency of the quizzes was used to increase student alertness during the lectures and to reinforce the

main concepts taught during the lecture. The instructor displayed lecture notes through PowerPoint during the lecture period. The students also had access to the notes through Blackboard. YouTube videos approved by the Information Systems department were included in the Blackboard course shell to enhance the learning experience of the students. The students were also required to complete a final HTML and JavaScript project which was based on their learning pod topic, computer forensics. While the students in the perceptions study relied more heavily on blackboard to learn the course material, the students in the performance study were in a more structured lecture based environment. In the performance study, the instructor would deliver a lecture which would last for roughly one hour. The standard PowerPoint slide presentations, developed by the Information Systems department, were used during each lecture. Following the lecture, the remaining hour of class time was devoted to the hands on exercises. The students were given an assignment from their textbooks which they were to complete before the end of the class period. The laboratory exercises incorporated all of the key concepts that the students were introduced to during the lecture period.

4. METHODOLOGY

Two sections of the course took part in the study. In one section, students' performance was measured pre- and post-learning the various technologies, while in the other, students' perceptions were sought at the end of the course concerning the level of support they perceive – A lot, Moderate, Not at all, for various higher-order thinking and team-building skills. Higher-order thinking skills were defined as: creative idea generation, problem-solving, critical thinking, conducting research, and the team-building skills were defined as: communication skills, team cooperation, work coordination. This they indicated for the various activities and resources of the course, such as textbooks used in the course, the activities and assignments in the course, the team project and the learning pod material, the material on Blackboard, Blackboard overall, and the discussion board topics. Students were also asked to answer a number of open-ended questions on what learning in this manner contributed that they would not otherwise have had. This questionnaire was adapted from one used in several previous research studies (Thomas, Driver, Coppola and Thomas, 2008; Thomas, Coppola, Braudy and Thomas, 2005; Thomas, 2003).

The performance study tested student performance through a series of quizzes given at the start and end of each class session. When students entered the classroom, they were asked to take a short multiple-choice quiz as a means of measuring their knowledge of the topic that they would be taught during that session. Students who were late or absent were not able to take the starting quiz because it would close automatically on Blackboard nearly 15 minutes after the time when the class was scheduled to begin. This measure was taken to prevent students from submitting the starting quiz after the instructor began the lecture.

The students were informed that the quizzes would not impact their final course grades in any way. They were motivated to take the quizzes because they knew that their instructors would be able to view the results and could thereby determine which concepts needed further clarification for the students. All of the quizzes reflected the main concepts that would be taught during each class session, so the students were introduced to the key concepts after taking the first quiz. The students were encouraged to remain alert throughout the class period in order to discover the correct answers to questions that they were unable to solve during the first quiz. The student's motivation to take the quizzes essentially came from their desire to receive high quiz scores and the quizzes were used as an aid in identifying the key concepts of each lesson.

After submitting the electronic quiz through Blackboard, the students would listen to a lecture by their instructor who explained all of the concepts the students saw in the opening quiz. The instructor also used PowerPoint during the lecture to list the main objectives and to provide visual aids for the students. After the instructor concluded the lecture, the students were given a hands-on exercise to complete, based on the concepts that they were introduced to during the lecture. Before leaving the classroom, the students were asked to take a final exit quiz, which was identical to the quiz they took before the start of the lecture. Some time constraints made it impossible for the instructor to complete all of the course lessons with the students.

5. RESULTS

Demographics

Perceptions Course Section:

Out of a class of 18 students, 14 responded to the online survey. Seven of the students were less than 20 years old and 6 were in the 20-29-age category. Most were female, 9 or 64%, 5 were male. Fifty-seven percent (57%) felt they had moderated experience with computers, while 21%, each, felt they had minimum or extensive experience.

Performance Course Section:

The entire class consisted of 27 students, however only 20 had some level of participation in the study. Of the 20 participants, 18 were female and the remaining 2 students were male. All of the students who participated in the study were 20 years old or younger. Level of computer experience was not collected in this section.

Perceptions

In the section of the course looking at the students' perceptions, very few indicated that the resources and activities of the course provided no support to their acquisition of the higher-order learning and team-building skills, 0-4 out of 14 students. The rest perceived moderate to a lot of support. The majority perceived moderate support 5 - 11 out of 14 students. These are clearly seen in Tables 1 and 2, in the Appendix.

The team project was perceived as offering a lot of support by 5-7 out of 14 students, whereas, the learning pod was rated as being a lot supportive by 1-2 of 14 students. Most viewed it as offering moderate support, 7-10 out of 14 students. Nonetheless, in both cases, the perceptions were more positive than negative, for the team-building skills, as well as the higher-order learning skills.

These largely positive perceptions were further evident in the responses to the targeted open-ended questions which follow, quoted verbatim as written by the students, including grammatical errors:

1. What did learning technology in the course provide that you would not otherwise have or be able to achieve? Total Response: 11

- How to use excel and java script
- A different way to view them
- The HTML projects were diff. Something I never thought would be as difficult as I experienced it.
- It provided me with information otherwise I would not have learned while taking this class
- A deeper appreciation of technology
- hands on experience.
- Computer skills that have because very useful to me in finding a jab.
- I learned HTML
- I learned how to create a website.
- I learned how to maneuver Java Script and HTML which I never done before
- How to manage and understand computer websites and indepth things.

2. What did being in a computer classroom bring to the course that you would not otherwise have or be able to achieve? Total Response: 11

- how to use excel and html
- The way to manage your own website
- It actually let me work at a computer while I was learning.
- Opportunities
- I loved the hands on atmosphere and actually do what you were being taught.
- in depth computer knowledge!
- A hands on experience was provided being in computer classroom.
- The ability to ask questions at will.
- I learned a lot more about excel and html.
- The computer classroom helped me to actually do the work because I got a better feel from it.
- Be online everyday.

3. What did learning the course in the context of a Learning Pod bring to the course that you would not otherwise have or be able to achieve? Total Response: 9

- how things on the computer work
- This experience lead me to consider computer studies as maybe a apart of my major.

- The context of the learning pod never really taught me that much.
- a lot of work
- it increased my awareness at the different advanced issues that are result of technology.
- communication and interaction with peers.
- It brought about issues that I otherwise wouldn't have thought about.
- I learned a lot more about protecting my information.
- It helped develop my mindset better on my project.

Performance

In terms of performance, 20 different students from the same class participated in some portion of the pre- and post-tests. The chart found in the Appendix, Table 3, is a breakdown of the average scores for the pre- and post-test, as well as the number of students participating in each quiz. The students scored an average of 10 points higher on three of the five quizzes that they took at the end of each class compared to at the beginning, the exceptions were the first and third quizzes for which there was essentially no change. Students did not engage in the JavaScript coding pre- and post-tests on assignments 1 and 2, probably indicative of the greater challenge this aspect of the course posed.

The students were told that the quizzes would help the instructors to see where the students may have faced challenges in understanding the course content. They were also informed that it would help them to identify and remember some of the key concepts that would be discussed during the lecture. Students were able to track their own progress by viewing their scores through Blackboard.

6. DISCUSSION

The fact that the sample is small for both studies makes it impossible to draw decisive conclusions, however, the responses indicate that students are perceiving the learning gains desired from the course. While it would have been nice to see more students perceiving a lot of support for the learning skills, it is encouraging that very few perceived no support. Also encouraging were the responses to the open-ended questions. Several students made insightful comments concerning the contributions they perceived were being gained from working in a computer lab, learning the technology, and learning within the context of a learning pod, and most importantly, how this might impact their future careers, comments such as 'It provided me with information otherwise I would not have learned while taking this class' (sic), ' I loved the hands on atmosphere and actually do what you were being taught' (sic), 'It bought about issues that I otherwise wouldn't have thought about' (sic).

Although more quizzes were offered during the semester, the students did not take advantage of the opportunity to participate. Computer Information Systems 101 is often viewed by non-majors as a demanding course, so the lack of participation could be reflective of how overwhelmed the students may have felt. Overall, the students showed signs of improvement in the post-tests. In addition, the Blackboard tracking feature revealed that, the content area of the Blackboard course shell was accessed by students more times than any other area of Blackboard. Even sections of Blackboard that held grade-dependent work did not receive as much attention as the content area, which held the YouTube videos and lecture notes.

Although more research is needed in this area, it appears from both studies that non-majors were able to benefit academically from the use of PowerPoint lecture notes, YouTube videos, and Blackboard, as a means of disseminating the course information, and positioning it all in the context of a learning pod.

7. CONCLUSION

Students of the 21st century need to have a solid understanding of computer technical skills, critical thinking, problem-solving, and teamwork (Prensky, 2008). While many young people use technology daily, this does not necessarily mean that they possess high-order technical skills that will allow them to excel beyond their superficial use of tech gadgets. "In order for young people to be considered competitive and capable employees we must improve technology education" (Fazarro, 2004). Monitoring the performance and perceptions of our students will help us to better understand the ways in which we can help them to connect with

technology on a deeper level. We want our students to emerge from their respective university experiences with a solid technological foundation, which will allow them to be invaluable assets in our ever-changing society.

Motivating non-IS majors in required computer literacy courses continues to be a challenge in realizing these lofty goals. Those charged with the mandate of content delivery grapple with trying to deliver content often viewed as dry and/or unessential for their stated fields of study. As technology now permeates every fabric of our existence, this is a grave misconception, so strategies that can ease this perceived irrelevance are essential. Concepts such as positioning learning within a context, namely a learning pod, to which the technology being learned is then applied, and incorporating other technology teaching tools, promises to be an aid in this regard. The fact that students recognized the long-term benefits of the learning experience in this study suggests that continued exploration of the effect of this approach on learning content and developing higher-order life-long learning skills has merit and should be pursued.

The ability to successfully function in this technological world will only increase the marketability of college graduates set to enter the workforce. The current economic climate has made it imperative that business majors especially have a strong understanding of technology in our society. More targeted research in teaching technology to business majors within the context of the social responsibility or computer forensics learning pods is an important topic for future research.

8. REFERENCES

Bergin, S. and R. Reilly (2006) "Predicting Introductory Programming Performance: A multi-institutional multivariate study." *Computer Science Education,*16(4) pp. 303–323.

Bishop-Clark, C., J. Courte and E.V. Howard (2006) "Programming in pairs with Alice to improve confidence, enjoyment, and achievement." *Journal of Educational Computing Research, 34*(2), pp. 213-228.

Bishop-Clark, C., J. Courte, D. Evans and E.V. Howard (2007) "A quantitative and qualitative investigation of using Alice programming to improve confidence, enjoyment and achievement among non-majors." *Journal of Educational Computing Research*, 37(2) pp. 193-207.

D'Angelo, J. and S. Woosley (2007) "Technology in the classroom: friend or foe." *Education*,127(4) pp. 462-471.

Fazarro, D. (2004) "Tech upward bound program to introduce students to the world of Technology." *Tech Directions*, 63(7) pp. 26-27.

Guo, R., T. Dobson and S. Petrina (2008) "Digital Natives, Digital Immigrants: An analysis of age and ICT competency in teacher education." *Journal of Educational Computing Research,* 38(3) pp. 235-254.

Kurkovsky, S. (2007) "Making computing attractive for non-majors: A course design." JCSC 22(3) pp. 90-97.

Messineo, M. and I. DeOllos (2005) "Are we assuming too much? Exploring students' perceptions of their computer competence." *College Teaching,* 53(3) pp. 50-55.

Prensky, M. (2008) "Turning on the Lights." *Educational Leadership*, 65(6) pp. 40-45.

Thomas, J.D.E. (2003) "Traditional computer lab classroom versus smart e-classroom in a distributed computing course." *International Conference e-Society,* pp. 771-721.

Thomas, J.D.E., J. Coppola, M. Braudy and B. Thomas, B. (2005) Comparison of Teaching Java in a Computer Classroom /Traditional Classroom vs. Smart E-Classroom and its Effect on Critical Thinking: A Case Study, Information Systems Education Journal, 2005, 3 (29), http://isedj.org/3/29/. ISSN: 1545-679X. (Also appears in The Proceedings of ISECON 2004: §2234. ISSN: 1542-7382.).

Thomas, J.D.E., M. Driver, J. Coppola and B. Thomas (2008) Looking Forward to Look Backward: Technology and King Arthur. AACE Journal. 16 (4), pp. 367-383.

APPENDICES

Table 1 – Student Perception Distributions
% Support for High-Order Thinking Skills (N=14)

Activities					
	N	S	L	Mean	SD
Critical Thinking Skills:					
Activities/ Assignments	7.14	57.14	35.71	1.71	0.61
Team Project	7.69	46.15	46.15	1.62	0.65
Public Blackboard Discussion Board	14.29	50.00	35.71	1.79	0.7
Problem Solving Skills:					
Activities/ Assignments	7.14	50.00	42.86	1.64	0.63
Team Project	7.14	42.86	50.00	1.57	0.65
Public Blackboard Discussion Board	21.43	42.86	35.71	1.86	0.77
Research Skills:					
Activities/ Assignments	14.29	50.00	35.71	1.79	0.7
Team Project	7.14	50.00	42.86	1.64	0.63
Public Blackboard Discussion Board	14.29	64.29	21.43	1.93	0.62
Creative Idea Generation:	7.14	71.43	21.43	1.86	0.53
Activities/ Assignments	7.14	42.86	50.00	1.57	0.65
Team Project	14.29	42.86	42.86	1.71	0.73
Public Blackboard Discussion Board					
Resources					
Critical Thinking Skills:					
Text	7.14	71.43	21.43	1.86	0.53
Learning Pod Articles	21.43	57.14	21.43	2.0	0.68
Blackboard Overall	21.43	57.14	21.43	2.0	0.68
Blackboard Material	0	78.57	21.43	1.79	0.43
Problem Solving Skills:					
Text	7.14	71.43	21.43	1.86	0.53
Learning Pod Articles	14.29	78.57	7.14	2.07	0.47
Blackboard Overall	14.29	64.29	21.43	1.93	0.62
Blackboard Material	14.29	50.00	35.71	1.79	0.7
Research Skills:					
Text	7.14	71.43	21.43	1.86	0.53
Learning Pod Articles	15.38	69.23	15.38	2.0	0.58
Blackboard Overall	0	71.43	28.57	1.71	0.47
Blackboard Material	7.14	71.43	21.43	1.86	0.53
Creative Idea Generation:					
Text	28.57	57.14	14.29	2.14	0.66
Learning Pod Articles	21.43	57.14	21.43	2.0	0.68
Blackboard Overall	28.57	57.14	14.29	2.14	0.66
Blackboard Material	14.29	64.29	21.43	1.93	0.62

Legend:
N (1)– Not at All; S – Moderate (2); L – A Lot; (3) M – Mean; SD – Standard Deviation

TABLE 2 – STUDENT PERCEPTION DISTRIBUTIONS % SUPPORT FOR TEAM-BUILDING SKILLS (N = 14)					
Activities					
	N	**S**	**L**	Mean	SD
Communication Skills:					
Activities/ Assignments	14.29	71.43	14.29	2.0	0.55
Team Project	7.14	50.00	42.86	1.64	0.63
Public Blackboard Discussion Board	14.29	57.14	28.57	1.86	0.66
Work Coordination:					
Activities/ Assignments	7.14	57.14	35.71	1.71	0.61
Team Project	7.14	50.00	42.86	1.64	0.63
Public Blackboard Discussion Board	28.57	42.86	28.57	2.0	0.78
Team Cooperation:					
Activities/ Assignments	7.14	57.14	35.71	1.71	0.61
Team Project	0.00	57.14	42.86	1.57	0.51
Public Blackboard Discussion Board	21.43	50.00	28.57	1.93	0.73
Resources					
Communication Skills:					
Text	14.29	78.57	7.14	2.07	0.47
Learning Pod Articles	14.29	64.29	21.43	1.93	0.62
Blackboard Overall	0	71.43	28.57	1.71	0.47
Blackboard Material	0	71.43	28.57	1.71	0.47
Work Coordination:					
Text	7.14	85.71	7.14	2.0	0.39
Learning Pod Articles	30.77	53.85	15.38	2.15	0.69
Blackboard Overall	7.14	50.00	42.86	1.64	0.63
Blackboard Material	14.29	71.43	14.29	2.0	0.55
Team Cooperation:					
Text	28.57	57.14	14.29	2.14	0.66
Learning Pod Articles	28.57	57.14	14.29	2.14	0.66
Blackboard Overall	14.29	64.29	21.43	1.93	0.62
Blackboard Material	14.29	57.14	28.57	1.86	0.66
Legend: N (1) – Not at All; S (2) – Moderate; L – A Lot (3); M – Mean; SD – Standard Deviation					

TABLE 3 – PRE- & POST-PERFORMANCE SCORES				
Chapter	**Pre Test**		**Post Test**	
	Average Score	**Number of Participants**	**Average Score**	**Number of Participants**
Excel Chapter 3	44	4	75	5
HTML Chapter 1	60	15	57.5	14
HTML Chapter 2	79.1	7	84.6	6
HTML Chapter 3	30	12	33	10
HTML Chapter 4	66	5	80	6
JavaScript Chapter1-2				
JavaScript Chapter3-5			81.5	5