

Thomas, J.D.E., Driver, M., Coppola, J.F., & Thomas, B.A. (2008).  
Looking forward to look backward: Technology and King Arthur. *AACE  
Journal, 16(4)*, 367-383.

## Looking Forward to Look Backward: Technology and King Arthur

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This article discusses students' perceptions of the impact of technology integration in an interdisciplinary medieval English literature and multimedia course on developing higher-order thinking skills and team-building skills. The results indicate that undergraduate students in this course perceived generally strong support for development of these skills, especially when exposed to the team-mode functionality of an electronic classroom, and had increased appreciation for the impact of this technology on their learning experience from the beginning to the end of the course.

Every era has sought the aid of some type of technology to enhance the transmission of learning, beginning with the caveman who utilized cave drawings to transmit and record ideas. We might call this the beginnings of the use of multimedia in learning. In recent times, we have resorted to such tools as blackboards, overhead projectors, videos, and more recently, computers (Coppola & Thomas, 2000). The efficacy of technology integration of any sort into courses is still a hotly debated topic. Technology for its own sake is not considered an appropriate justification for its inclusion. It should in some manner contribute to learning objectives identified by educators and society as meaningful for students to acquire (McEuen, 2001).

Educators and industry agree that higher-order thinking skills (Herrington & Oliver, 2000; Shumacher, West, & Angell, 1997; Cook et al., 1996; Lewis & Smith, 1993) and team-building skills (Chin & Carroll, 2000; Jones, 1994) are important tools for students to acquire from their program of study. The South Carolina Higher Education Assessment Network Critical Thinking Task Force agreed on a definition of critical thinking, which they adapted from a number of authors: "Critical thinking is a reflective, systematic, rational, and skeptical use of cognitive representations, processes, and strategies to make decisions about beliefs, problems, and/or courses of action" (Cook et al., 1996, p. 9). In the California Critical Thinking Skills Test©(CCTST), critical thinking skills are comprised of several important components identified as: Analysis, Inference, Explanation, Evaluation, Interpretation, Self-Regulation (Facione, 1990).

This study examines the effect of technology integration, as well as other course resources, on students' perceptions of the contribution these make to their development of selected higher-order skills and team-building skills, in an undergraduate interdisciplinary medieval English literature and multimedia course (Smith, 2004). Results indicate that their perceptions were favorably enhanced as a consequence of these inclusions. The research design, methodology, results, discussion, and conclusion are presented.

## RESEARCH DESIGN

The purpose of this article is to examine students' perceptions of technology integration on the acquisition of higher-order thinking skills, such as conducting research, problem solving, critical thinking and generating

creative ideas, and on team-building skills, such as communication skills, team cooperation, and work coordination. The technologies integrated into a survey course in English literature that examines works from Beowulf to King Lear were an electronic classroom, which uses the Robotel™ system, an online class-management tool, Blackboard™, and training in HTML code for creating web-based documents with which to present their analyses in a multimedia context (Chism, 2004). Other course resources included readings for the course, content and images from the Internet and on a class site, and various classroom activities and assignments.

## METHODOLOGY

The course was originally taught for many years as a straightforward survey of medieval and Renaissance literature. In fall 1996 a new version of the course was introduced combining the use of technology with substantial literary content. The course satisfies the university's second-level literature course requirement and also fulfills one elective in computing, though this should be renegotiated as the students spend a lot of time creating their pages in response to the literature (Anstendig, Meyer, & Driver, 1998; Driver & Meyer, 1999).

Students are introduced to the computer classroom and materials on the Web on the first day and are given instruction in HTML throughout the semester. The major assignments are: a group HTML project, analyzing different sections of the Anglo-Saxon poem Beowulf. Requirements include strong writing (and editing), appropriate images, internal links, and annotated links to at least two external sources. Then follows an individual HTML project analyzing an assigned passage of the fourteenth-century romance Sir Gawain and the Green Knight, which includes a clearly written analysis essay, at least one appropriate image, and possibly an image map. For the character analysis, students choose a character from the King Arthur legends or from Chaucer's Canterbury Tales to present in hypertext. This includes a character analysis essay, some history or related materials, external links, images, an image map and a sound clip of a reading from an appropriate text or an original monologue created by the student for her character. The course concludes with a group capstone project, for which students produce either a Virtual Museum of their best assignments from the semester, supplemented by external links and other materials, or a hypermedia

interpretation of a scene from *King Lear*. The best student work (B+ and up) is published on an Internet site housed at Pace University. During the course, students are encouraged to revise and rewrite essays so that they will qualify to be published on the Web. In the last few years, students have also been asked to participate in discussions on Blackboard as well as to read and understand the lectures posted there.

Since 2001, our students have also been able to discuss *Beowulf* and *King Arthur* with students in a class titled “Heroes and Villains” at Western Michigan University through videoconferencing and Internet-2. Students were excited to meet their counterparts at another institution and share their ideas about *Beowulf*, films of *Beowulf*, and the *King Arthur* legends in two videoconference sessions during the semester. Students at both institutions, one urban, the other in the Midwest, discovered that many of their questions and observations on the medieval texts were the same. The exercise also brought out competitiveness between the students, the Pace University class becoming extremely articulate and expressive about the texts, even more so than in the usual classroom. Last semester, the Western Michigan students began to talk to the Pace students through Blackboard, and the plan is for this to continue in subsequent courses. The purpose of these exercises is to bring students into a larger learning community across institutions and to create cadres of student-scholars who will be taught to use Internet materials and their student networks as adroitly as adult scholars. The hope is to extend the connection with Western Michigan so that students can form study groups across campuses to create networks of learning. The interface created by Internet-2, as well as its future possibilities for use in the humanities, is very exciting.

To realize this, students work in an electronic classroom dubbed a “smart e-classroom” in which computers can be used independently by students or in group-mode. These facilities allow for the sharing of screens and keyboards and the iterative development of the same project on the same computer by a group of students. Other features include the ability to project from instructor station or student stations to selected stations or all stations, full multimedia capability, seamless integration of video player, projection screens, computer, electronic whiteboard, and electronic writing pad (Coppola & Thomas, 2000).

The e-classroom© facility, Robotel™ is a software and hardware-based technology, which facilitates access to the Internet, access to multimedia capabilities for viewing and creating documents, a facility for student sharing of computer screens and for working in teams, and a facility for projecting computer screens to and from the instructor and among students, whether individually, as a group, or as a class. Blackboard™ facility is a software-based technology that provides, along with instructor course management facilities, student access to online course material, discussion board and electronic mail. Both facilities have other functionalities. However, only those functions that were used are indicated here. The Robotel™ facility by which computers can be put into team-mode and have students in the team take control of each other's computers and keyboards, without moving chairs, to iteratively develop a single document was introduced in Section 2 (team-mode) of the course but not in Section 1 (nonteam-mode).

Grades were collected along with a survey of students' perceptions of the support the technologies and course resources provided to their acquisition of higher-order learning skills, including critical thinking skills, problem-solving skills, research skills, and creative idea generation skills as well as team-building skills, such as communication skills, team coordination, and team cooperation skills. In the second section, perceptions concerning e-classroom© technology integration were also collected at the beginning of the course and at the end of the course. Both sections were taught by the same two instructors over two terms, using the same material, content, and instructional design.

## RESULTS

### Demographics

There was an approximately equal number of students, 13 and 15, in both sections of the course and most were in the 20-29-age category, 54% and 67%, respectively. Section 2 had a more or less even split of males, 47%, and females, 53%, whereas in Section 1, three quarters of the class were females. Most of the students in Section 1 had moderate computer experience, 62%, whereas in Section 2, it was evenly split between minimal and moderate computer experience, 47% for both (Table 1).

**Table 1**  
Demographic Distributions

% N	Section 1 Nonteam-mode 15	Section 2 Team-mode 13
<b>Age:</b>		
<20	38	33
20-29	54	67
30-39	8	0
39+	0	0
<b>Gender:</b>		
Male	25	47
Female	75	53
<b>Computer Experience:</b>		
Minimal	23	47
Moderate	62	47
Extensive	15	6
Note: Team-mode refers to the facility in Robotel technology to put computers in an electronic classroom into teams.		

### Grades

Grades were collected for 18 students in both of the sections which, surprisingly, were higher for the students in the nonteam-mode section (Table 2).

**Table 2**  
Student Grades

N	Section 1 Nonteam-mode 18	Section 2 Team-mode 18
A	4	2
A-	3	3
B+	4	3
B	2	3
B-	4	1
C+	0	1
C	0	3
INC/F	1	2
Note: Team-mode refers to the facility in Robotel technology to put computers in an electronic classroom into teams.		

## Perceptions

Depending on the section, one or two surveys were administered to gauge students' perceptions. Students in both sections were asked to rate the support they perceived the technologies used, the course readings and the activities and assignments provided for acquiring critical thinking skills and other higher-order learning skills, as well as for acquiring team-building skills (Appendix A). Support was rated as either None, Some, or A Lot. In addition to this, students in Section 2 were asked to complete pre and postsurveys (Appendix B) concerning their perceived satisfaction with the electronic classroom to determine changes from beginning to the end of the course.

### SKILLS SUPPORT SURVEY

#### Thinking Skills

The distributions indicate that students in the team-mode section, Section 2, perceived much more support of all the higher-order thinking skills from the integration of the various technology elements, and from the other course resources employed, than did the students in Section 1, the nonteam-mode section (Table 3). The percentages of the team-mode section perceiving a lot of support ranged from 33-71%, except in the case of Robotel's™ team-mode support for research skills, 14%, compared to the range for the nonteam-mode section, which was from 8-39%. In Section 1, the activities and assignments and material on Blackboard™ were perceived by one third (31-42%) of the students as providing a lot of support for developing critical thinking, research skills, and generating creative ideas. A third of students also thought Blackboard™ overall supported research skills and creative idea generation a lot.

The strength of the students' perceptions about the Robotel™ system is evident in that more than a third (36-40%) of the students in Section 2 felt that the Robotel™ system overall and its team-mode facility supported the higher-order thinking skills, except for the support for research skills as mentioned previously, (14%), which seems a reasonable perception to have since no research is involved in its use.

**Table 3**  
Skills Support Perceptions Distributions–Thinking Skills

% Support for Higher-Order Thinking Skills	Section 1– N = 13 Nonteam-mode			Section 2– N = 15 Team-mode		
	A Lot	Some	None	A Lot	Some	None
<b>Readings:</b>						
Critical Thinking Skills	15	62	23	40	40	20
Problem-Solving Skills	8	77	15	33	40	27
Research Skills	8	77	15	33	54	13
Creative Idea Generation	15	62	23	40	40	20
<b>Activities/ Assignments:</b>						
Critical Thinking Skills	31	54	15	71	29	0
Problem-Solving Skills	23	62	15	33	67	0
Research Skills	31	54	15	67	33	0
Creative Idea Generation	31	54	15	60	40	0
<b>Blackboard Overall:</b>						
Critical Thinking Skills	15	70	15	47	33	20
Problem-Solving Skills	23	62	15	54	33	13
Research Skills	39	46	15	53	40	7
Creative Idea Generation	38	54	8	40	40	20
<b>Blackboard Material:</b>						
Critical Thinking Skills	31	46	23	47	40	13
Problem-Solving Skills	23	54	23	53	47	0
Research Skills	31	46	23	67	33	0
Creative Idea Generation	42	33	25	67	20	13
<b>Blackboard Discussion:</b>						
Critical Thinking Skills	17	50	33	40	40	20
Problem-Solving Skills	8	54	38	40	40	20
Research Skills	23	46	31	47	33	20
Creative Idea Generation	23	46	31	54	40	6
<b>Robotel Overall:</b>						
Critical Thinking Skills				40	54	6
Problem-Solving Skills				40	54	6
Research Skills				40	60	0
Creative Idea Generation				47	40	13
<b>Robotel Team-mode:</b>						
Critical Thinking Skills				36	57	7
Problem-Solving Skills				36	50	14
Research Skills				14	86	0
Creative Idea Generation				43	50	7
<b>Note: Team-mode refers to the facility in Robotel technology to put computers in an electronic classroom into teams.</b>						



Students in Section 1 appear to perceive lesser support of higher-order thinking skills from readings in the course (8-15%) and online discussions (8-23%) than was indicated for the course activities and assignments (23-31%), Blackboard™ overall (15-39%), and course material on Blackboard™ (23-42%). This difference is not evident in Section 2. Generally, it seems that perceptions are far more favorable when the team-mode functions of the Robotel electronic classroom are integrated.

Very few students indicated that they perceived no support at all from the technology integration which, on any of the dimensions, ranged from zero to, at most, 38%. It was only the Blackboard™ Discussion Board that was rated by 30-38% as not providing any support to acquiring these skills.

### **Team-Building Skills**

Again with respect to acquiring team-building skills, students in Section 1 perceived greater support from course activities and assignments (23-31%), Blackboard™ overall (31-39%), and course material on Blackboard™ (23-46%) than from the readings (8-15%) or the online Blackboard™ discussions (15-23) (Table 4). This difference is much less marked in Section 2, except for support of communication skills by the readings (27%) and by the Robotel team-mode (29%). Again, perceptions of those in Section 2, where the team-mode functions of the Robotel™ electronic classroom are integrated into the course, are far more favorable for all categories with most percentages higher than 40% (except as noted) than those in Section 1, which range from 8-46%, where it was not.

As with the thinking skills, very few students perceived no support for acquiring team-building skills from the technology integration, 0-33%.

**Table 4**  
Skills Support Perceptions Distributions–Team Building

% Support for Team-Building Skills	Section 1 – N = 13 Nonteam-Mode			Section 2 – N = 15 Team-Mode		
	A Lot	Some	None	A Lot	Some	None
<b>Readings:</b>						
Communication Skills	15	62	23	27	40	33
Work Coordination	8	69	23	40	40	20
Team Cooperation	8	61	31	40	47	13
<b>Activities/ Assignments:</b>						
Communication Skills	23	62	15	47	47	6
Work Coordination	31	54	15	60	40	0
Team Cooperation	31	54	15	53	47	0
<b>Blackboard Overall:</b>						
Communication Skills	39	46	15	67	33	0
Work Coordination	31	61	8	54	33	13
Team Cooperation	39	46	15	60	27	13
<b>Blackboard Material:</b>						
Communication Skills	31	46	23	67	33	0
Work Coordination	46	31	23	73	20	7
Team Cooperation	23	46	31	60	20	20
<b>Blackboard Discussion:</b>						
Communication Skills	23	54	23	54	33	13
Work Coordination	15	62	23	40	47	13
Team Cooperation	15	62	23	54	26	20
<b>Robotel Overall:</b>						
Communication Skills				47	47	6
Work Coordination				60	40	0
Team Cooperation				47	47	6
<b>Robotel Team-Mode:</b>						
Communication Skills				29	64	7
Work Coordination				36	57	7
Team Cooperation				43	50	7

**Note: Team-mode refers to the facility in Robotel technology to put computers in an electronic classroom into teams.**

SATISFACTION SURVEY

Table 5 shows the distributions of the satisfaction surveys, administered at the beginning and end of the course to Section 2, concerning the electronic classroom. The distributions indicate that the percentage of students agreeing or strongly agreeing with the statements on the survey increased markedly from the beginning to the end of the course, including those

questions related to increased stress. Notwithstanding this perception of increased stress from using the technology, they felt technology also increased their opportunity to know classmates, to develop new communication skills, be better motivated in the course, and have better retention of material. See Appendix B for a listing of all questions.

**Table 5**  
Satisfaction Survey

Ques.	N=20											
	Strongly Agree Or Agree		%		Undecided		%		Strongly Disagree Or Disagree		%	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST
1	13	12	65	80	7	2	35	13	0	1	0	7
2	6	7	30	47	10	6	50	40	4	2	20	13
3	2	6	10	40	10	1	50	7	8	8	40	53
4	8	11	40	73	9	2	45	13	3	2	15	13
5	3	5	15	33	12	7	60	47	5	3	25	20
6	12	11	60	73	8	3	40	20	0	1	0	7
7	15	12	75	80	5	2	25	13	0	1	0	7
8	8	7	40	47	12	6	60	40	0	2	0	13
9	10	11	50	73	9	4	45	27	1	0	5	0
10	9	11	45	73	10	3	50	20	1	1	5	7
11	11	11	55	73	8	4	40	27	1	0	5	0
12	5	12	25	80	10	2	50	13	5	1	25	7
13	9	11	45	73	9	4	45	27	2	0	10	0
14	0	7	0	47	9	4	45	27	11	4	55	27
15	10	11	50	73	9	3	45	20	1	1	5	7

Prior to using the electronic classroom, more than 60% agreed, or agreed strongly, that Q1- interactive technology would foster positive feelings about the content of the course, Q6 – electronic / interactive classroom would provide opportunities for small team assignments, Q7 – would learn a new set of communication skills, 65%, 60%, 75%, respectively. These figures changed to 80%, 73%, 80%, respectively, after use. Questions 4, 9, 10, 11, 13, and 15 showed increases from 40, 50, 45, 55, 45, 50%, respectively, to 73% for all. These questions related to: Q4 – if given the choice I'd choose the electronic classroom, Q9 – electronic classroom learning is more student-centered, Q10 – electronic classroom will improve attitude to course content, Q11 – anti-glare shields will provide privacy for quizzes and exams, Q13 – electronic classroom will help retention of course content, Q15 – electronic classroom will enhance motivation and participation. All other questions also showed marked increases from the beginning to the end

of the course. Of particular note is Q 14 – use of the electronic classroom will/ did make me feel more stressed than a standard classroom, which went from 0% to 47 % perceiving this stress.

These perceptions are further borne out by the comments provided by students on the perception surveys administered to both sections, a sampling of which follows. Students responded to the question: “What did the integration of technology provide that you would not have had otherwise?”

Student 1: It made learning more easy and fun.

Student 2: Interest in the subject, without the multimedia portion of the course. It probably would not have stuck out more than any other literature course at Pace.

Student 3: This is a good course.

Student 4: Instructor X was a pleasure to have as an instructor.

Student 5: I learned how to make a web-page and areas in places to research documents. E.g., Pace Internet Library.

Student 6: It helped me understand computers a little better and helped me learn how to do HTML

Student 7: The computing environment was effective at providing easy research.

Student 8: I increased my experience in HTML.

Student 9: It provided an interest[ing] work experience. Where it was ind (sic) of entertaining learning about the subject matter. The technology should be used more in other subjects. It makes the learning process easier and more enjoyable.

Student 10: Awesome

Student 11: I already wrote an essay about this. I liked it.

## DISCUSSION

The results are quite interesting. While the numbers in the study are small, it would appear that use of a smart electronic classroom in learning medieval English Literature can have a favorable impact on changing students’ perceptions from the beginning of a course to the end of the course, notwithstanding their feelings of increased stress from using this technology. In particular, it would seem that having the facility to work in team-mode using the Robotel™ system results in greatly enhanced students’ perceptions of the contributions to the development of their higher-order learning skills and their team-building skills than without this facility. Nonetheless, the perception of the support provided by the various course resources to the development of these skills was generally favorable, in either situation. However,

readings for the course and online discussions were perceived to offer less support for the team-building and higher-order thinking skills by those not exposed to the Robotel™ team-mode facility. In the team-mode section, communication skills supported by the readings and the Robotel team-mode had a lower percentage of those rating them as providing a lot of support than in the other categories. On all the dimensions, very few students perceived no support from integrating technology. These perceptions did not translate into grades, however, as those in the nonteam-mode section received higher grades than those in the team-mode section.

## CONCLUSION

Integrating technology into an interdisciplinary medieval English literature and multimedia course, at least those associated with Blackboard™, the Robotel™ system, and learning HTML, has proven to be a positive addition to the course. This has potential implications for all courses, as it would seem that even though there is some additional stress associated with making use of technology, students are nonetheless favorable to its use and perceive benefits to their development of important higher-order thinking and team-building skills, which has the potential for favorably influencing students' perceptions of the course. The hope is also that these perceptions translate into improved performance in grades and in the actual acquisition of higher-order thinking skills such as critical thinking. In this small sample, the improvement in the grades was not seen, but there may be more to the story than just grades. In a future paper, the results from data collected through the California Critical Thinking Skills Test Inventory© (Facione, 1990) will be analyzed and presented.

Evidently, more research is necessary to tease out these issues, across more students, instructors, and courses. Of interest also is whether integrating videoconferencing technology influences perceptions and grades in the same way, given the passive nature of this integration, in contrast to the active involvement with the technology required in the electronic classroom.

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*Association for the Advancement of Computing In Education Journal, 16(4)*

**Appendix A. Electronic Classroom Skills Support Perception Survey**

Please take a few moments to answer a some questions regarding the areas of learning which you felt were supported by various technology used in the course, as well as some demographic information.

Gender:	Male	<input type="checkbox"/>		20-29	<input type="checkbox"/>	30-39	<input type="checkbox"/>	Female	<input type="checkbox"/>
Age:	<20	<input type="checkbox"/>						39+	<input type="checkbox"/>
Computer Experience:	Extensive	<input type="checkbox"/>		Moderate	<input type="checkbox"/>			Minimal	<input type="checkbox"/>
Robotel Experience:	Extensive	<input type="checkbox"/>		Moderate	<input type="checkbox"/>			Minimal	<input type="checkbox"/>
Work Experience: Type							Years		

**In answering the questions below, please refer to the definitions provided here:**

**Conducting Research** – investigating, finding, and synthesizing information from multiple sources

**Communication Skills** – conveying ideas effectively, both orally and written

**Problem-solving** – deriving alternatives and solutions for complex problems/ issues with incomplete information

**Creative Ideas** – Ideas that are novel or unique

**Coordinating work** – bringing together work from multiple sources and team members

**Cooperation** – interpersonal skills, resolution of differences

**Critical Thinking** – analysis, inference, reasoning, evaluation, explanation, interpretation

1. How did the **Textbook** assist you in the following learning objectives?

Conducting research:	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Developing communication skills	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Problem-solving	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Developing creative ideas	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Thinking critically	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Coordinating work	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Cooperation among team members	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>

2. How did the **Cases** assist you in the following learning objectives?

Conducting research:	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Developing communication skills	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Problem-solving	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Developing creative ideas	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Thinking critically	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Coordinating work	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Cooperation among team members	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>

3. How did the **Activities/ Assignments** assist you in the following learning objectives?

Conducting research:	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Developing communication skills	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Problem-solving	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Developing creative ideas	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Thinking critically	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Coordinating work	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Cooperation among team members	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>

4. How did **Blackboard as a whole** assist you in the following learning objectives?

Conducting research:	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Developing communication skills	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Problem-solving	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Developing creative ideas	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Thinking critically	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Coordinating work	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Cooperation among team members	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>

5. How did **Material in Blackboard** assist you in the following learning objectives?

Conducting research:	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Developing communication skills	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Problem-solving	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Developing creative ideas	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Thinking critically	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Coordinating work	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Cooperation among team members	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>

6. How did **Blackboard's Discussion Board** assist you in the following learning objectives?

Conducting research:	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Developing communication skills	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>
Problem-solving	A lot	<input type="checkbox"/>		Somewhat	<input type="checkbox"/>		Not at all	<input type="checkbox"/>

Developing creative ideas	A lot		Somewhat		Not at all	
Thinking critically	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Coordinating work	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Cooperation among team members	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>

7. How did the **Robotel classroom as a whole** assist you in the following learning objectives?

Conducting research:	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Developing communication skills	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Problem-solving	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Developing creative ideas	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Thinking critically	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Coordinating work	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Cooperation among team members	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>

8. How did the **Robotel team-mode** feature assist you in the following learning objectives?

Conducting research:	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Developing communication skills	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Problem-solving	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Developing creative ideas	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Thinking critically	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Coordinating work	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>
Cooperation among team members	A lot	<input type="checkbox"/>	Somewhat	<input type="checkbox"/>	Not at all	<input type="checkbox"/>

9. What did **integrating the Robotel technology** into the course provide that you would not otherwise have had or been able to achieve?

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**Appendix B - Pace University-Learning Environment Pre/Post-Student Satisfaction Survey**

*Association for the Advancement of Computing In Education Journal, 16(4)*

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	N/A
ctive technology has caused me to feel positive about the content when using it.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
nteractive technology for each class has given me the opportunity to know everyone in my class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
electronic/interactive classroom, I have felt more anxiety than in a standard classroom.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
nd the opportunity to choose between an electronic/interactive or regular classroom, I will chose ic interactive.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
electronic/interactive classroom it was important for me to have direct eye contact with the teacher classmates.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
lectronic/interactive classroom has given me the opportunity to do small group assignments and a team.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
electronic/interactive classroom I learned a new set of communication skills.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
tations from the instructor has changed in an electronic/interactive classroom.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
electronic classroom, I have felt learning is more student-centered.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
lectronic/interactive classroom, I had an improved attitude toward the content of the course.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g black anti-glare shields in the electronic/interactive classroom will gave me the opportunity for when taking quizzes or electronic based exams.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n my class met in an electronic/interactive classroom, I tended to arrive earlier and/or stay later.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e electronic/interactive classroom I retained more information from the content covered.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g the electronic/interactive classroom made me feel more stressed than a standard classroom.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e electronic/interactive classroom, I felt motivated and excited to come to each session.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**PLEASE ADD COMMENTS AND SUGGESTIONS ABOUT THE ROOM ON THE BACK OF THIS FORM. THANK YOU**