

Different Technology Integrated Classes and Critical Thinking Skills

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ABSTRACT

This paper discusses the results of a study conducted with a graduate, introductory information systems course, to assess the impact of different types of technology integration on students' critical thinking, and on their perceptions of support received. The results indicate that a classroom, which incorporates multiple technology approaches, has the potential to increase critical thinking. In addition, students deemed support for critical thinking to be better when a combination of technologies were integrated.

Keywords: Electronic classrooms, technology integration, teaching and technology, critical thinking.

1. INTRODUCTION

Critical thinking is one of the most important skills we wish our students to take away with them from our courses. If, and how, technology might assist in doing this is important for us to know and understand. (Branzburg, 2001; Soules & Adams, 1998; Facione, et.al., 1998). In the study presented here, different technologies were utilized. Technology integration ran the gamut from strictly lecture classroom format to full "smart e-classroom" format, to each of these formats with the support of the course management software, Blackboard. The smart e-classroom is defined as "an interactive multimedia electronic classroom networked to the Internet and housing a video/ audio/ keyboard/ mouse broadcast-on-demand system". (J. Coppola and B. Thomas, 2000). This classroom allows 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 includes the ability to project from the 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. Administering pre- and post- California Critical Thinking Survey Tests (CCTST) (Facione, 1998), and a perception survey, we were able to examine the impact various technology integrations had on students' critical thinking skills scores and on their perceptions of support provided for developing these skills. In this paper, we present the results of this study.

2. THE STUDY

The study compared the traditional lecture classroom with the electronic classroom and with the integration of Blackboard support with each of these. There were four sections, the traditional lecture room format only section, the lecture plus Blackboard support section, the electronic classroom section, and the electronic classroom plus Blackboard section. All sections were taught by the same instructor to ensure content

equivalence. In each class, working in teams, all sections analyzed different aspects of a case called Healthlite, and at the end of the term, analyzed a major case called Ginormous, also in teams (Laudon and Laudon, 1999). In the traditional classroom sections, students worked in class in teams of 3-5 by rearranging classroom desks into circles. Those in the electronic classroom had the luxury of having their computers hardwired into teams of three or four, which allowed them to take control of team members' computers to iteratively develop their solutions. Those using Blackboard for support could interact outside the classroom to continue the analysis. In the traditional classroom and the electronic classroom sections, course material was presented via overhead slides. In the lecture plus Blackboard support section and the electronic classroom plus Blackboard section, course material was stored in Blackboard which student could access at will, in or out of class.

Grades were collected for all the sections along with students' perceptions of the support offered critical thinking skills by the analysis of the Healthlite case used throughout the term. These skills included conducting

research, problem-solving, critical thinking and creative idea generation.

The research questions of interest were:

Is there a difference in students' critical thinking skills scores as a result of different types of technology integrations?

Is there a difference in students' perceptions of support for critical thinking skills as a result of different types of technology integration?

3. RESULTS

Demographics

There were twenty-nine students in the electronic classroom (EC) section and thirty-nine in the traditional classroom plus Blackboard section (TC+BB). There were thirty-two students in the traditional classroom (TC) section and twenty-one in the electronic classroom plus Blackboard section (EC+BB). In all sections, most students were in the 20-29 age category, from 65 to 69% of the students, and had moderate computer experience, from 47 to 67% of the students in each section. (See Table 1, below)

%	N	Gender		Age				Computer Experience		
		Male	Female	<20	20-29	30-39	39+	Min	Mod	Ext
EC	29	69	31	0	65	25	10	37	52	11
TC+BB	39	63	37	0	69	28	3	24	47	29
TC	32	69	31	3	68	29	0	12	50	38
EC+BB	21	52	48	0	66	29	5	9	67	24

Performance: - Critical Thinking Scores:

The mean CCTST scores of those in the traditional classroom with no technology support went from 12.8 on the pre-test to only 13.4 on the post-test, and remained the same when Blackboard support was added, 11.28 to 11.0. On the other hand, those in the electronic

classrooms exhibited marked increases between the pre- and post-tests. The mean scores for those in the e-classroom without Blackboard support went from 10.32 to 14.28, while the scores went from 11 to 14.5 when the e-classroom was supported with Blackboard.

	EC		TC+BB		TC		EC+BB	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
N	31	25	29	29	30	26	22	20
Mean	10.32	14.28	11.28	11	12.8	13.4	11	14.5
Median	7	14	11	11	13	13.5	10	14.5
Mode	10	14	11	11	11	15	9	8
Std. Dev.	3.64	3.86	3.14	3.52	3.6	4.6	3.5	5.5

Performance: - Grades

There were no differences in the Healthlite grades which ranged from 78% to 84%. There were differences in the Ginormous grades, the reasons for which are unclear. The traditional classroom section had an average grade

of 78%, which jumped to 96% when Blackboard support was provided. The electronic classroom section had an average grade of 96% on the Ginormous case but only 78% when Blackboard support was offered. (See Table 3, below)

%	EC	TC+BB	TC	EC+BB
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Healthlite	82	84	78	80
Ginormous	96	96	78	78

Perceptions: Critical Thinking Skills

Those in the traditional classroom with Blackboard support perceived more support for conducting research, problem solving, critical thinking and creative idea generation (26%, 47%, 46%, 44%, respectively), than those in the e-classroom without this support (17%, 35%, 45%, 36%, respectively). (See Table 4, below). The same results are shown with more of those in the e-classroom plus Blackboard perceiving support for problem solving, critical thinking and creative idea generation (57%, 71%, 57%, respectively), but not conducting research, than those in the traditional classroom without any technology integration. More students in the traditional classroom perceived support for conducting research (53%) than those in the e-classroom with Blackboard support (43%). Overall, it would seem that more support for critical thinking skills was perceived by those students with access to the e-

classroom and Blackboard than those only in the electronic classroom or in the traditional classroom supported with Blackboard as they went about using the Healthlite case throughout the term.. (See Appendix for a copy of the survey).

Comments from the few students who contributed any support these findings:

Student 1 - "I think I would be motivated to come to class where computers can be available to all students and working in groups would improves our skills". (sic)

Student 2 - "All computer based courses should be in an electronic classroom/interactive room. I know personally for me, I enjoy my course more when computers are in the classroom."

Student 3 - "I really have enjoyed using this classroom, I like the way it is set up and utilized."

TABLE 4 – CRITICAL THINKING SKILLS PERCEPTIONS				
	EC	TC+BB	TC	EC+BB
Conducting Research	17	26	53	43
Problem Solving	35	47	53	57
Critical Thinking	45	46	66	71
Creative Ideas	36	44	53	57

4. CONCLUSION

There were unexplainable differences in students' grades on the Ginormous case which served as the students' final exam, but no differences in the Healthlite case grades which was used throughout the term. There were marked differences in the California Critical Thinking Skills Test scores (CCTST) from beginning to the end of the course. Those in the e-classroom, with or without Blackboard support, had considerable improvements compared with those in the traditional classroom from the pre- to the post- critical thinking skills test scores. The integration of both the e-classroom and Blackboard support with lectures resulted in greater perceived support for problem solving, critical thinking, and creative idea generation. Surprisingly, those in the traditional classroom felt more support for conducting research than in either of the classes supported with technology notwithstanding the greater access to external resources available on the Internet from the e-classroom.

The preliminary results of this study indicate that the CCTST scores certainly suggest that technology integration had a positive impact on students' critical thinking. Likewise, students perceived that various thinking skills were being supported by the technologies as they went about their coursework, except with respect

to conducting research as noted above. This, however, did not translate to improved grades. Future research will be done in this area to better understand the results and the reasons underlying the results of this assessment.

The research is important for teachers who increasingly are being asked to integrate technology into their courses. If this integration can have a positive impact on critical thinking then we are better preparing our graduates for the workforce (Facione, Facione, and Giancarlo, 1997). Of interest also is which types of technology integration contribute to which types of improved learning. These will certainly be the focus of subsequent research in the area.

5. REFERENCES

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6. APPENDIX

Electronic/ Traditional Classroom Survey Dr. J. Thomas

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 Female
Age: <20 20-29 30-39 39+

Computer Experience:
Extensive Moderate Minimal

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

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

Creative Ideas – Ideas that are novel or unique

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

How did **the Healthlite case, used throughout the term**, assist you in the following learning objectives?

Conducting research:

A lot Somewhat Not at all

Problem-solving:

A lot Somewhat Not at all

Developing creative ideas:

A lot Somewhat Not at all

Thinking critically:

A lot Somewhat Not at all