Comparing Student Performance and Perceptions in Face-to Face, Distance Education, and Blended Course Delivery Environments

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Abstract

The Quality Engineering Technology (QET) Department at Sinclair Community College in partnership with the National Center for Manufacturing Education (NCME) received a NSF-ATE project grant in August 2003 to develop and test a hybrid (blended) instructional delivery methodology. The instructional design uses small group and activity-based materials developed under previous grants in conjunction with web-based content and learning objects support. This combination allows face-to-face interaction to occur despite the groups' working at different locations and times. Created web-based supplemental instructional materials and learning objects support the previously developed instructional modules.

One of the primary outcomes of the NSF-ATE grant, *A Distributed Hybrid Approach to Creating a Community of Practice Using NSF Funded Manufacturing Engineering Technology Curriculum Modules* — DUE 03-02574, is to evaluate the effectiveness of the delivery method as a means to increase the number of students in manufacturing-related programs by providing institutions, companies, and students a way to work together both onsite and online in a cost-effective, practical way. Houdeshell and Pomeranz (2004) described the distributed hybrid instructional delivery method as an instructional system that "uses activity-based instructional materials for the face-to-face component, while online interactions allow the individual small groups (nodes) at the various sites to function as part of a larger class, despite working at different locations and times"[1]. Of secondary importance of this study is to test Clark's famous "media does not influence learning" statement [2]. Ultimately achieving the grant outcomes will answer one of Clark's fundamental evaluation question "Did the distance education media maximize student access to new, and/ or high quality courses and teaching when compared with other delivery choices? Access means increasing new groups of students and increasing access to the teacher"[3]. This paper review previous findings and presents new results related to student perceptions, and academic performance, when comparing a defined hybrid (lecture: on-line, laboratory: face-to-face) instructional delivery mode to pure face-to-face and to distance education delivery.

Background and Findings

Houdeshell (2004) reported that early on unexpected challenges were encountered with "no students volunteering to join a "hybrid" site i.e. not coming to class but meeting with an instructor/facilitator in a small group to carry out the activities"[4]. The author interviewed classes as to their reluctance to be excused from coming to face-to-face classes at the college. Students cited "I learn a lot from other student's questions". As a result, a questionnaire to determine student's perceptions when comparing distance, hybrid (blended) and face-to-face instruction was administered. The results of that survey to three different classes utilizing face-to-face delivery, and fifty-six students in two pure

distance-learning 200 level courses, students concluded that the only significantly different statement was; “Being required to attend class is helpful in motivating me to learn the material”[4]. The distance education students scored this as less important as a motivator when compared to the face-to-face students and that the only major benefit perceived by students for distance learning is convenience. This begged an answer to the question “Does the delivery mode affect student performance and retention?”

A review of student performance and retention in three different courses (tables one and two) offered in three different instructional delivery modes (face-to-face, hybrid, pure DE) demonstrated that the night and distance students typically are more successful based on the grade distribution patterns. A second observation is that the delivery mode does not appears to have a significant impact on student performance in support of Clark’s stated postulate that media does not influence learning [2].

Table 1.
Quality Engineering Technology Course Information Involved in the 2006 Study.

Course Name	Course Number	Delivery Mode	Number of Students	Grade Average
Survey of TQ	101-01 Day	Face-to-Face	219	3.08
(101) and	101-50 Evening	Face-to-Face	196	3.42
Laboratory (171)	101-D1	Video Tape	16	3.14
	101-49	Virtual	10	3.67
	171-01 Day	Face-to-Face	10	3.64
	132-01 Day	Face-to Face	109	3.44
Metallurgy (132)	132-50 Evening	Face-to Face	162	3.45
and	132-49	Virtual	6	3.33
Laboratory (173)	173-01 Day/Eve	Face-to Face	6	3.50
	201-01 Day	Face-to Face	107	3.00
	201-50 Evening	Face-to Face	109	3.25
Statistical Process	201-TC	Web DE	15	3.42
Control (201) and	201-49	Virtual	13	2.67
Laboratory (181)	181-01/50 Day	Face-to Face	13	2.91

A review of the actual grades, illustrated in table two, indicated that the day section had a larger spread of grades with predominately A’s and the evening only reporting A’s and B’s and a higher percentage of withdraws.

Table 2.
Distribution of Grades by Percent in Metallurgy (QET 132).

Section	A’s	B’s	C’s	D’s	F’	W’s
Day - 01	72	15	6	1	1	5
Eve - 50	79	9	0	0	0	11

The author also observed the same pattern in the comparison of the QET 201 day sections and the QET 201 web based course sections where the TC sections have A’s and B’s and lots of withdraws. A possible reason for this observed grade pattern is the typical differences between the day and night students with a higher percentage of the typically

full time college students enrolled during the day, compared to fully employed part time evening students. The author has observed that these "adult" students are success oriented and will drop a class when outside demands make it difficult to earn their A. Table three reports the Chi-Squared results when comparing courses based on, day versus evening sections and delivery mode.

Table 3.
Grade Distribution Comparisons between Quality Engineering Technology Course Sections.

Course and Section Comparisons	df	χ^2	p	Action
101-01 vs. 101-50	5	16.61	0.0053	Reject Same Distribution
101-01 vs. 101-D1	5	3.54	0.6171	No Significant Difference
132-01 vs. 132-50	5	9.12	0.1042	No Significant Difference
201-01 vs. 201-50	5	14.64	0.0120	Reject Same Distribution
201-01 vs. 201-TC	5	15.78	0.0075	Reject Same Distribution
201-01 vs. 201-49/181-01/50	5	2.50	0.8688	No Significant Difference

Additional Student and Faculty Perceptions

Over the past year data additional students have been surveyed in both face-to-face, and hybrid offerings as to their preferences for learning. These paired data t-test results displayed in Appendix A provides insight into the student's perceptions as to the benefits of face-to-face instruction versus pure distance delivery and face-to-face instruction versus hybrid delivery. Students enrolled in face-to-face, distance education, and hybrid (pre and post completion) defined the major perception outcomes. First, distance education students prefer face-to-face except for the convenience of distance education classes. They also perceived that it would be easier to work with other students within a face-to-face environment for all other questions. Face-to-face students prefer face-to-face instruction to pure distance education and inconclusive results for students preferences concerning pure face-to-face over a hybrid delivery. This could be based on the students' comfort level with the content material and preferred learning style [5].

The group of distance-learning students answering the same questionnaire concurred with the face-to-face student results with the exception of two questions. The distance-learning students perceived, at a very significance level, that it would be easier to get questions answered within a face-to-face environment and also concluded participating in distance learning classes was more convenient than face-to-face classes. The students also completed questions related to their learning styles and social interaction, no differences were apparent for these questions except for the statement; Being required to attend class is helpful in motivating me to learn the material. The distance education students scored this as less important as a motivator when compared to the face-to-face students.

Faculty perceptions follow student perceptions and for those results of the analysis for both students and faculty are found in Appendix A. The answers to faculty questions that did not apply to students typically reflect the amount of effort required in the classroom or on-line. Face-to-face classes are perceived to require the least amount of preparation and hybrid and distance education classes require the most.

During the Fall Quarter 2006 Investigator Susan Chudde conducted a telephone

survey of seven students (Age Group: 20-29 – 4/7, 30-49 – 2/7, 50-59 – 1/7; 4/7; Work full time, 1/7 work part time, 2/7 full-time students) enrolled in hybrid classes (QET 201, 202, and/or 211) revealed the following information found in table four. The targeted survey stated that their largest concern was getting answers to questions. Within the selected courses the lectures were available on CD in a Quick Time format.

Table 4.
Telephone Survey of Students Enrolled in Hybrid Classes

Question	Student Response
What attracted you to this blended learning class?	No other choices available or requirement for degree (4/7). Best fit for schedule (3/7).
What do you like most about your blended learning class?	Review lecture as many times as needed (Lectures on CD in Adv Statistical QC, QET 202 and Reliability, QET 211 courses - 2/7) Work at your own pace" (4/7) "Have someone demonstrate how to do the work" (1/7) Lab time allows "one-on-one with instructor" (1/7)
What is the hardest part of taking a blended learning class?	Nothing (1/7) Staying motivated (2/7) Getting answers to questions (4/7)
Would you be interested in taking another class using blended learning?	Yes (7/7)
Comments:	I have taken traditional online courses in the past and would prefer not to take any more classes using this method. I find the questions and ideas generated in the classroom (lab face-to-face time) enhance the learning experience. My classes are towards a degree, not just for self-fulfillment.
Would you recommend this class to your friends?	Yes (7/7)

Summary

The impact of the documented project adds to the scope of body of knowledge related to barriers to adoption. One of the most commonly cited reasons for blending is more effective pedagogical practice. "BL is the combination of instruction from two historically separate models of teaching and learning: traditional F2F learning systems and distributed learning systems"[6]. This approach ends the isolation of pure distance education student by providing a combination of group face-to-face and individual asynchronous learning opportunities. The author concurs that well developed hybrid or blended courses based on sound instructional delivery are effect in student learning and retention. Since the original grant was funded in 2003 many authors have touted hybrid and blended instruction[7-9]. The challenge is finding methods and practices that aid in

overcoming the barriers to adoption based on administrative policy, faculty reluctance and student misconceptions.

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Cited References

1. Houdeshell, J. and G. Pomeranz. *Preliminary Results from a NSF-ATE Funded Distributed Hybrid Instructional Delivery Project*. in *ASEE Annual Conference and Exposition, "Engineering Education Reaches New Heights"*. 2004. Salt Lake, Utah: American Society for Engineering Education.
2. Clark, R.E., *Media will never influence learning.* Educational Technology Research and Development, 1994. **42**(2): p. 21-29.
3. Clark, R.E., *Evaluating Distance Education: Strategies and Cautions.* Quarterly Review of Distance Education, 2000. **1**(1): p. 3-16.
4. Houdeshell, J. *Results From the NSF-ATE Distributed Hybrid Instructional Delivery Project*. in *ASEE Annual Conference and Exposition "The Changing Landscape of Engineering and Technology Education in a Global World*. 2005. Portland, Oregon: ASEE.
5. Martinez, M., *Designing Learning Objects to Personalize Learning*, in *The Instructional Use of Learning Objects*, D.A. Wiley, Editor. 2002, AIT/AECT: Bloomington, IN. p. 151-171.
6. Graham, C.R., *Blended Learning Systems: Definitions, Current Trends, And Future Directions*, in *Handbook of blended learning: Global Perspectives, Local designs*, C.J. Bonk and C.R. Graham, Editors. 2004, Pfeiffer Publishing: San Francisco, CA. p. 31.
7. Stinson, J., *A Continuing Learning Community for Graduates of an MBA Program: The Experiment at Ohio University*, in *Learning-Centered Theory and Practice in Distance Education*, T.M. Duffy and J.R. Kirkley, Editors. 2004, Lawrence Erlbaum Associate: Mahwah, NJ. p. 167-182.
8. Giguere, P. and J. Houdeshell, *Strategies and techniques for facilitating hybrid approaches to Web-based learning*. 2005, 21st Annul Conference on Distance Teaching and Learning: Madison, WI.
9. Swenson, P. and M. Evans, *Hybrid courses as learning communities*, in *Electronic learning communities: Current issues and best practices*, S. Reiseman, Editor. 2003, Information Age Publishing: Greenwich, CT. p. 27-71.

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Susan Chudde, CIA, a marketing specialist earned her B.S. degree in Economics. She worked for six different companies typically as their marketing manager, before becoming a consultant.

Appendix A

Faculty Perception Response

Student Response

How hard will it be to respond to questions?

Delivery	Average
FtF	4.27
Hybrid	4.00
Web**	3.32

Receive answer to a question?

Delivery	Average
FtF	3.83
Hybrid**	3.22
Web***	3.11

How hard will it be to have students work in teams?

Delivery	Average
FtF	4.41
Hybrid**	3.41
Web***	2.36

Work with other students?

Delivery	Average
FtF	3.38
Hybrid**	2.68
Web***	2.18

How hard will it be to teach the course?

Delivery	Average
FtF	4.41
Hybrid***	3.45
Web***	2.86

Easy to learn?

Delivery	Average
FtF	3.23
Hybrid**	2.67
Web***	2.43

How hard will it be for an average student to do well in the course?

Delivery	Average
FtF	4.05
Hybrid***	3.09
Web***	2.45

How much time will students spend if they want to do well in the course?

Delivery	Average
FtF	3.41
Hybrid	3.57
Web*	4.10

How convenient would it be to take the course in the face-to-face format? Distance-learning? or hybrid formats?

Delivery	Average
FtF	3.05
Hybrid	3.05
Web FtF**	2.18
Web DE**	3.80

Faculty response continued

How much time will you spend on the course?

Delivery	Average
FtF	3.27
Hybrid***	3.95
Web***	4.36

How satisfied will you be teaching the course?

Delivery	Average
FtF	4.41
Hybrid*	3.82
Web***	2.86

*	p<0.1
* *	p<0.01
* * *	p<0.001

