

Pedagogical Characteristics of Online and Face-to-Face Classes

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Currently, many students have had experience with both face-to-face and online classes. We asked such students at 46 different universities in the United States to evaluate the pedagogical characteristics of their most recently completed face-to-face class and their most recently completed online class. The results show that students rate online classes as greatly superior to face-to-face classes in terms of convenience and allowing self-pacing, but they also rate online classes as inferior on a number of other characteristics. Online and face-to-face instructional formats each have their own strengths and weaknesses. Detailing those strengths and weaknesses should help us modify both methods of teaching to reduce the weaknesses and maintain the strengths.

Online education will continue to shape the way people learn in the 21st century. In a global economy where professionals need to update their technical skills and knowledge constantly, and where communication across large distances is often very desirable, online education should be delivered wherever and whenever needed. Online education is a field in which change is continuous; therefore, both instructors and students must be adaptable, knowledgeable, and keep up with the pace of technological advances. In many cases, online education systems offer flexibility and convenience that cannot be achieved with face-to-face classroom settings.

Advantages of face-to-face courses over online courses may include the following:

1. Social and spatial awareness is natural in face-to-face classrooms. Students observe the reactions of other students and their instructors.
2. The physical arrangement of the face-to-face classroom (e.g., the placement of student desks, a blackboard, audiovisual equipment) plays an important role in the interaction between students and instructors. In comparison, with online course delivery systems, the interface is limited to the computer monitor.
3. Interaction with classmates is easier in the traditional classroom. Both social and intellectual interactions are immediate, dynamic, and more efficient than with the online education environment.
4. In face-to-face education, the facial expressions and body language of students provide a feedback mechanism for instructors. For example, instructors can easily understand when students' attention levels decrease from their body language and facial expressions. This is not currently possible with online education.
5. Face-to-face communication is faster and more efficient than online communication. When using online course delivery systems, a considerable amount of time and effort may be spent in decoding and creating email messages, chat logs, and other textual information. The communication time in online education can be 29% greater than face-to-face learning (Kennedy, 2002). In a physical classroom setting, instructors can easily channel their students' attention to a certain element of the course material. In the typical online education setting, instructors' messages tend to get lost among other textual material and may not be noticed by students.
6. The student assessment process is usually perceived to be more reliable in a traditional face-to-face instruction. In online education, there is a geographical distance between students and instructors; therefore, it is often difficult or even impossible for instructors to control the testing environment.

The computer has been one of the most powerful agents of change in human behavior over the past century, yet the complex interaction between the use of computers and the dynamics of behavior of those who interact with computers continues to be a challenge. Online education has experienced dramatic growth during the last decade and now comprises an increasingly significant portion of the teaching activities in many institutions. Over 1,200 degree programs are now offered online by about 900 accredited colleges (Inman & Corrigan, 2001). The technology has progressed rapidly, but we really do not know whether the delivery methods are equally effective.

Some differences between online education and face-to-face systems are obvious, most notably face-to-face communication, but the impact on the

effectiveness of online education due to differences in social awareness, social interaction, and exchange of ideas is less clear. Because of these differences, both teachers and learners may anticipate that the effectiveness and overall quality of online education is inferior to the traditional face-to-face teaching environment. To maximize the effectiveness of online education, there must be a clear understanding of online education environments in terms of their major differences from traditional face-to-face education, especially with regard to social and psychological dynamics, cognitive processes, and technological elements. Research studies on the pedagogical characteristics of current online and face-to-face course delivery systems are needed to help education system designers develop optimum learning environments.

The Internet and multimedia-based systems offer a spatially and temporally flexible instructional delivery system that provides learners with a convenient learning environment (Chang, 2002). However, whether online education systems meet the efficiency of face-to-face classroom learning, despite the diversity and capability of the available technologies, has not been established convincingly. The majority of online education systems use online course management systems that are mainly text-based (e.g., Blackboard, Web CT, email, online chat rooms, and discussion boards).

Advanced applications such as additional multimedia elements (e.g., video, voice, lecture slides, bulletin board systems, electronic whiteboard; Haga, 2002) are less frequently used (Notar, Wilson, & Ross, 2002). While some integration of these elements has been proposed (video and bulletin board systems in Haga), in the final analysis, existing multimedia based online education systems do not provide a seamless platform that integrates all of the educational elements without distracting the users. In online education systems, the intellectual and social interaction between instructors and students is not so efficient as in the traditional classroom setting, because online education students and instructors are geographically dispersed. If instant messenger is available, online education students are known to feel a stronger sense of community (Nicholson, 2002). In fact, Swan (2001) found that students who perceived instructor and peer interaction to be high reported increased satisfaction with distance learning; instructor interaction had the largest influence on student satisfaction with the distance course. Student-instructor interactions enhance student retention, self-motivation, and pass rates.

The effectiveness of online education has been studied by many researchers. For instance, Arbaugh (2000) investigated the keys to student satisfaction in a distance learning environment to assist instructors in distance course development. Arbaugh utilized five MBA graduate courses that varied from face-to-face, asynchronous, and a combination of the two. Positive relations with student satisfaction were found for both perceived use-

fulness of the software and course/program flexibility. Similarly, Biner, Barone, Welsh, and Dean (1997) examined student satisfaction in telecourses as a predictor of academic performance. Results showed that satisfaction with technology and with quick instructor responses regarding course work was positively related to student performance.

Previous research has produced mixed results when comparing online to face-to-face courses in terms of student satisfaction. Beard and Harper (2002) compared student attitudes and opinions regarding traditional and online instructions. The online students reported dissatisfaction with the quality of interaction among students and with the instructor, and problems with hardware and software. They were pleased with the ability to self-pace that was enhanced in the online course. Although many of the students indicated that they would be interested in taking another internet course, overall they preferred the one-on-one interaction of a traditional course.

In a similar study DeLourgh (1999) focused on factors of satisfaction among students in a fully interactive teleconferencing online course. Results indicated that instructor/instruction was the only variable that explained the variance in student satisfaction with the course. Another study (Johnson, Aragon, Shaik, & Palma-Rivas, 1999) reported some differences in the students' being adequately informed about their course progress, instructor-student interaction, and treatment of students, with the online students reporting lesser satisfaction.

Ponzurick, France, and Logar (2000) found that MBA students rated the distance method as ineffective and were less satisfied with that mode of course delivery. Vamosi, Pierce, and Slotkin (2004) also found that students were less satisfied and less efficient with the distance portion of a financial accounting course.

Students are especially likely to express dissatisfaction when they are taking their very first online course. Wisan, Nazma, and Pscherer (2001) reported that such students are much more satisfied with face-to-face classes than with online classes, but that students who had already taken four or more online courses indicated higher levels of satisfaction. This effect of previous online course experience may result from students learning how to function better in the online environment and/or it may result from attrition, with those students most dissatisfied with online education simply not taking any more online classes after their first bad experience with such a class.

Although significant differences between online and face-to-face instruction have frequently been reported, also frequent have been reports of the differences having fallen short of statistical significance. Spooner, Jordan, Algozzine, and Spooner (1999) found no statistically significant differences between local and distance students' evaluation. Fredericksen, Pickett, Shea, Pelz, and Swan (2000) found no statistical differences in student evaluations between online and face-to-face courses, but the authors noted the impor-

tance of student-instructor interactions when moving traditional courses to the web. Similarly, White (1999) found no significant difference in student performance for students who took an online class and another group who received face-to-face instruction. There is no conclusive research that encompasses all of the relevant attributes of online education such as different student demographics, large sample sizes, and different disciplines. A more extensive assessment is needed to evaluate the differences between online and traditional learning environments. Studies seeking to incorporate a large, diverse sample from various academic disciplines are needed.

The purpose of the presently reported research was to compare students' perceptions of the pedagogical characteristics of online classes with those of face to face classes. We expected that these two methods of delivery would differ greatly on some but not all characteristics.

METHOD

The Online Survey

A team of faculty developed a survey instrument designed to measure student attitudes toward various pedagogical characteristics of both online and face-to-face courses. Drafts of the survey were shared with members of focus groups comprised of faculty with extensive experience with online teaching and graduate students with experience taking online courses. Among the questions asked of the focus group participants was "what pedagogical characteristics differ between online and face to face classes." Feedback from these focus groups was used to modify the survey prior to its deployment. The complete survey can be viewed online at <http://core.ecu.edu/psyc/wuenschk/StudentSurvey.htm>.

The survey was administered in both online and paper formats in spring and summer of 2006. The sampling procedure is best described as one of convenience, but it also included some elements of cluster random sampling and snowball sampling.

Paper surveys were taken to on-campus classes at our university and three other universities within easy driving distance of our university. We deliberately selected a diverse sample of classes, which had moderate to large enrollments and the approval of the instructor to allow time in class for the students to complete the survey.

We randomly selected at least one university from each of the 50 states in the United States. When possible, we then emailed to a large proportion of the students at each university an invitation to participate in our survey. This invitation explained the purpose of the survey and pointed the students to the url where the survey was located. Potential respondents were advised that each student who completed the survey would be entered in a raffle, with two respondents randomly chosen to receive a prize (an iPod). Students

were also asked to share the invitation with other students who might be interested in participating in the survey. We had no way to know how many students actually read the emails we sent.

Those who completed the online survey were asked to provide their university email address. It was explained that these addresses would not be paired with their responses, so their responses would be confidential. Our survey software did check the validity of each respondent's email address, rejecting any which were not valid university email addresses or which had been used with a previous completion of the survey. Aside from being used to verify student status and prevent individuals from completing the survey more than once, our only use of the email addresses was to contact those who won prizes.

The survey consisted of 86 items. Twenty-two of the items on the survey concerned the students' perceptions of the pedagogical characteristics of online and face-to-face classes. They were asked to rate on a five-point scale (from 1 = very low to 5 = very high) for their most recently completed online class and for their most recently completed face-to-face class the following pedagogical characteristics: (a) quality of communication between instructor and students, (b) quality of communication with other students, (c) convenience, (d) pleasantness of the experience, (e) aid in learning of complex material, (f) organization of course materials, (g) allowing you to self-pace, (h) accurate evaluation of your learning, (i) amount of effort necessary to complete course, (j) overall understanding of course material, and (k) level of difficulty of course.

Respondents

A total of 4,789 students completed the survey (3,420 online and 1,369 on paper). Respondents were students from 46 different universities and colleges in 26 different states of the United States. The modal student was a female (65%) senior (23%) undergraduate student.

After culling data from respondents who had not taken at least one online course and at least one face-to-face course, there were 1,601 students who provided complete data on their evaluations of the pedagogical characteristics of their most recently completed online class and their most recently completed face-to-face class (1,160 completed the online survey, 441 the paper survey).

Results

Correlated *t* tests were used to compare the face-to-face ratings with the online ratings. For every characteristic there was a statistically significant difference ($p < .01$) between the mean face-to-face rating and the mean online rating (Table 1).

Table 1
Mean (Standard Deviation) Ratings of Eleven Pedagogical Characteristics
of Face-to-Face and Online Classes

Characteristic	Face-to-Face	Online	<i>t</i>	<i>g</i>
Convenience	3.15 (1.15)	4.45 (0.86)	33.82	1.28
Allowing Self-Pacing	2.77 (1.22)	4.00 (1.13)	30.25	1.05
Communication with Other Students	4.15 (0.98)	3.24 (1.30)	23.17	.79
Aid Learning Complex Material	4.09 (1.01)	3.33 (1.20)	18.56	.68
Difficulty of the Course	3.95 (0.92)	3.50 (1.02)	14.19	.46
Communication with Instructor	4.26 (0.94)	3.83 (1.17)	11.52	.40
Amount of Effort Necessary	4.09 (0.88)	3.80 (1.03)	9.48	.30
Accurate Evaluation of Learning	4.00 (0.98)	3.68 (1.17)	8.56	.30
Understanding of Course Material	4.12 (0.86)	3.85 (1.06)	8.16	.28
Organization of Course Materials	4.12 (0.94)	3.99 (1.05)	3.94	.13
Pleasantness	3.90 (1.03)	3.79 (1.15)	2.98	.10

The largest differences were that online courses were rated as being greatly superior to face-to-face courses in terms of convenience and allowing the student to self-pace. Medium to large differences were found on the ratings of facilitating communication with other students and aiding the learning of complex material, with face-to-face courses being more favorably rated. Small to medium-sized differences were found on all other characteristics except pleasantness and organization of course materials. Students reported that face-to-face classes were more difficult than online classes, better facilitated communication with the instructor, required more effort, provided better evaluation of their learning, and led to a greater overall understanding of the course material. Face-to-face classes were also rated as significantly more organized and pleasant than online classes, but the magnitude of the differences was so small as to be of no practical importance. The *g* statistic is the estimated difference between two means in standard deviation units. By convention, .2 is considered a small difference, .5 a medium-sized difference, and .8 a large difference.

DISCUSSION

This study was the first step in a continuing program of research designed to yield enhanced systems for the delivery of online courses. It was exploratory in nature, designed to determine which pedagogical characteristics of online learning are most in need of improvement.

The results clearly indicate that students find online courses to be more convenient than face-to-face courses, a result also found by others (Ponzurick et al., 2000; Vamosi et al., 2004; Wisan et al., 2001). Online courses were perceived as superior to face-to-face classes in terms of allowing self-pacing, a result also reported by Beard and Harper (2002). On the other hand, students also perceived weaknesses of online courses. They reported that online courses were inferior to face-to-face courses with respect to communication with instructors and other students, the learning of complex material, evaluation of their work, and overall understanding of the course material. Student reports that online courses do not satisfy their desire for communication between instructor and student and among students have frequently appeared in the literature (Beard & Harper; Johnson et al., 1999; Swan, 2001; Wisan et al.). Online students who report high levels of interaction with the instructor and with other students also report greater levels of learning than do students who report lower levels of interaction with the instructor and other students (Fredericksen et al., 2000). Biner et al. (1997) reported that student's relative performance (final grade in the course adjusted to remove the effect of prior grade point average) is positively related to the promptness of delivery of course materials (which is, in part, a subset of instructor-student communication).

Among the limitations of the reported research is that the actual sample may differ from the intended sample in unknown ways. Those who responded to our request to complete the survey may have differed from those who did not respond. Mono-method bias is a potential threat to the construct validity of our measurement of student attitudes. Although it is true that our survey measured these attitudes with a single set of items, it should be remembered that some triangulation was achieved by our having first asked focus groups to address the research question and then using their suggestions in the construction of the survey items. Ideally we would have also measured their attitudes by other methods as well, such as direct observation of their academic behaviors, interviews with the students, asking the respondents' friends about their perception of the respondents' attitudes to online and face to face classes, and so on. Of course, gathering such multiple-method measurements on a national sample would be exceptionally difficult.

The moderately large sample size may also be considered a limitation of sorts – with large sample sizes even effects which are trivial in magnitude may be detected as “statistically significant.” Our reporting of estimates of the standardized magnitude of the effects should make less likely the common error of mistaking “significant” effects for “big” effects. The moderately large sample size did allow more precise estimation of the size of the differences between online classes and face to face classes than would have been possible with a smaller sample size. For example, a 95% confidence interval for the standardized difference on the “communication with instructor” item runs from .33

(small to medium) to .47 (medium). By contrast, were the sample size only 100, this confidence interval would run from .12 (trivial) to .68 (medium to large).

Educational researchers now need to focus on finding the technological characteristics of online classes which best contribute to making online classes at least equivalent to face-to-face classes in terms of pedagogical effectiveness. The deployment (or more effective deployment) of existing technologies may be part of the solution. For example, Nicholson (2002) reported that the inclusion of instant messaging in online instruction increased students' ease of communicating with the instructor and other students. It is also anticipated that newly developed technologies will address the current weaknesses of online courses.

Online education will continue to change how individuals learn in the 21st century. In a global economy, it is necessary for professionals to regularly update their technical knowledge, skills, and abilities. It is essential that online education be delivered wherever and whenever required. For example, at the authors' university, a course was delivered successfully to two groups of students who were located in different countries (the U.S. and China). Online learning systems provide the convenience and flexibility that cannot be attained in the traditional face-to-face classroom setting. The most problematic issue with existing distance education systems is that they do not effectively consider the wants and needs of the instructors and the students. Our belief is that it is possible for online systems to equal or surpass traditional face-to-face teaching methods in many ways, through the identification of strengths of face-to-face instruction and the development of methods that enable online education to apply similar strengths. In addition, we believe that by applying sophisticated technology, most students will find online courses to be more appealing and attractive. Improving the effectiveness of online education is imperative given that education is expected to increase its reliance on online systems in the near future.

It is of utmost importance that we have a knowledge base of how to make online learning convenient and accessible to all users. The current study results provide the knowledge base for our next research project. Specifically, the authors plan to build an online learning system that will enhance the effectiveness of the online education experience for both instructors and students alike.

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Note

The research described here was supported by NSF grant BCS-0525087.