Behavioral assessment of online education

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Abstract

Online education (OE) is an increasingly significant portion of the teaching activities in many institutions. In OE systems, courses are delivered over the Internet using a course web site. Some differences between OE and Face-To-Face (FTF) systems are obvious, most notably the lack of FTF communication, but the impact on the effectiveness of OE due to technological limitations and differences in social awareness and exchange of ideas is less clear. Because of these differences, both teachers and learners may anticipate that the effectiveness and overall quality of OE is inferior to the traditional FTF teaching environments. In order to maximize the effectiveness of OE, there must be a clear understanding of OE environments in terms of their major differences from traditional FTF education, especially with regard to social and psychological dynamics, cognitive processes, and technological elements. This study aims to establish how both users and non-users of OE systems perceive the effectiveness of OE. To achieve this goal, an online questionnaire, developed by the authors, was administered to a random sample of students and instructors. Survey results, major deficiencies, and advantages of current OE systems in cognitive processes, social awareness, and learning experiences are reported in this paper. It is our hope that the findings of this study will help OE developers optimize their systems.

Keywords: online education, behavioral assessment, distance education.

1 Introduction

Though the computer is one of the most powerful agents of change in human behavior in the past century, the complex interaction between the use of
computers and the dynamics of behavior of those who interact with computers continues to be a challenge. As computers became smaller and more powerful over the past few decades, it became much easier to have them perform tasks previously conducted by humans.

Online Education (OE) has experienced dramatic growth during the last decade, now comprising an increasingly significant portion of the teaching activities in many institutions. Over 1200 OE degree programs from about 900 accredited colleges currently exist (Inman and Corrigan [1]). Despite the rapid increase in technology, we still need to determine whether the delivery methods are equally effective. In order to understand why OE systems might be as effective as FTF systems, we need a better understanding of the human dynamics of learning that may be altered in the OE environment. Though some differences between OE and FTF systems are obvious, most notably the lack of FTF communication, changes in the effectiveness of OE due to differences in social awareness, social interaction, and the exchange of ideas among students and between students and faculty is less clear. Because of these potential differences, both teachers and learners may anticipate that the effectiveness and overall quality of OE is inferior to the traditional FTF teaching environments.

In order to maximize the effectiveness of OE, there must be a clearer understanding of OE environments in terms of their major differences from traditional FTF education, especially with regard to social and psychological dynamics, cognitive processes, and technological elements. The authors’ finding may be used to build the theoretical and empirical framework to enable OE system designers to develop optimum learning environments equivalent to, or better than, FTF classroom learning.

The Internet and multimedia-based systems offer a spatial-temporal flexible instructional delivery system that provides learners a convenient learning environment (Chang [2]). However, whether OE systems meet the efficiency of FTF classroom learning, despite the diversity and capability of the available technologies, has not yet been established. The majority of OE systems use web-based course management systems that are mainly text-based. Advanced applications such as multimedia elements (e.g., video, voice, lecture slides, bulletin board systems, and electronic whiteboard) are less frequently used. While some integration of these elements has been proposed (video and bulletin board systems, Haga [3]), in the final analysis, existing multimedia-based OE systems do not provide a seamless platform that integrates all of the educational elements without distracting the users. If instant messenger is available, OE students are known to feel a stronger sense of community (Nicholson [4]), as the intellectual and social interactions between instructors and students are not as efficient as in the traditional classroom setting because OE students and instructors are geographically dispersed.

2 Behavioral assessment of OE systems

This paper presents exploratory research geared toward the development of hypotheses about the influence of the OE environment on learning effectiveness.
We sought to explore perceptions of OE and how users view the effectiveness of OE systems as a function of the types of technologies used. A number of research methods and techniques can be used, including literature reviews, surveys, classroom observations, experiments, analyses of existing data, and focus group studies. By gathering information from multiple sources, one can have a snapshot of the current status of OE systems. Based on our OE experience at East Carolina University, several advantages of FTF learning that are missing in OE can be summarized as follows:

- Social and spatial awareness is natural in FTF classrooms. Students observe the reactions of other students and the instructors. The physical and spatial arrangement of the classroom also plays an important role (e.g., the placement of student desks, a blackboard, AV equipment). With OE systems, the interface is limited to the PC monitor.

- Interaction with classmates is easier in the traditional classroom. Social and intellectual interaction is immediate, real-time, and more efficient than the OE environment. Many OE systems do not facilitate interaction between students.

- In FTF education, facial expressions and body language of students provide a feedback mechanism for the instructor. For example, instructors can easily understand when students’ attention levels decrease from their body language and facial expressions. With typical OE, there is no way for the instructor to observe, in real time, how students are responding to the material.

- FTF communication is faster and more efficient than OE systems. Direct communication can resolve problems quickly, while in OE systems, a considerable amount of time and effort may be spent in decoding and creating email messages, chat logs and other textual information. According to the findings of a recent study (Kennedy [5]), the communication time in OE is 29% greater than FTF learning.

- In a physical FTF classroom setting, instructors can easily channel their students’ attention to specific elements of the course material. On the other hand, in the typical OE setting, instructors’ messages tend to get lost among other textual material and may not be noticed by students.

- The student assessment process is usually perceived to be more reliable in traditional FTF instruction. In OE, there is a geographical distance between students and instructors, so it is often difficult or even impossible for instructors to control the testing environment.

While OE cannot replace all elements of FTF learning, it can serve as a reasonable alternative when the latter is unavailable (Gal-ezer [6]). Many disadvantages of OE systems can be eliminated by using more elaborate technologies, better user interfaces, and more efficient system architecture. Currently there is no mature OE model or architecture that can compete with the
FTF learning. This study aims to develop a foundation for behavioral assessment of current OE systems.

The current effectiveness of OE versus FTF was evaluated through a questionnaire concerning students’ perceptions and experiences of OE. The questionnaire was developed by the authors and reflected their own experiences with FTF and OE formats. The questionnaire includes questions about resources and perceived effectiveness; it was administered to a broad sample of students at ECU (both those who have experience with OE courses and those who do not).

3 Analysis of the survey results

A total of 157 undergraduate students enrolled at East Carolina University voluntarily participated in this study. Thirty-six percent of the respondents indicated that they had previously taken at least one online course(s).

The research questionnaire was designed to collect information on five different course elements. Specifically, students provided their opinions regarding (a) overall effectiveness, (b) interactions with others, (c) communication between the instructor and students, (d) convenience, and (e) understanding complex ideas for both online and face-to-face courses. A 1 (very poor) to 5 (very good) Likert scale was used to solicit perceptions regarding the five study variables of interest. Each of the five variables was analyzed using an analysis of variance with one within-subjects variable (Format: FTF compared to OE) and one between-subjects variable (Experience: no OE courses taken compared to one or more OE courses taken). Mean Course Element ratings by Experience and Format are shown in Table 1.

Table 1: Evaluation of online and face-to-face courses, by experience and format.

<table>
<thead>
<tr>
<th>Course Element</th>
<th>Format</th>
<th>Experience</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Face-to-Face</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>Effectiveness</td>
<td>M</td>
<td>4.38</td>
<td>4.52</td>
<td>3.54</td>
<td>3.14</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>.63</td>
<td>.66</td>
<td>.92</td>
<td>.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>52</td>
<td>69</td>
<td>52</td>
<td>69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactions</td>
<td>M</td>
<td>4.39</td>
<td>4.59</td>
<td>2.10</td>
<td>1.88</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>SD</td>
<td>.49</td>
<td>.60</td>
<td>1.12</td>
<td>.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>51</td>
<td>69</td>
<td>51</td>
<td>.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>M</td>
<td>4.35</td>
<td>4.44</td>
<td>2.96</td>
<td>2.69</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>SD</td>
<td>.59</td>
<td>.65</td>
<td>1.23</td>
<td>.97</td>
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<tr>
<td></td>
<td>N</td>
<td>51</td>
<td>70</td>
<td>51</td>
<td>70</td>
<td></td>
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<tr>
<td>Convenience</td>
<td>M</td>
<td>3.27</td>
<td>3.27</td>
<td>4.42</td>
<td>4.25</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>SD</td>
<td>.97</td>
<td>1.12</td>
<td>1.04</td>
<td>1.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>52</td>
<td>71</td>
<td>52</td>
<td>71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complex ideas</td>
<td>M</td>
<td>4.24</td>
<td>4.23</td>
<td>2.78</td>
<td>2.46</td>
<td></td>
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<tr>
<td></td>
<td>SD</td>
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</tr>
<tr>
<td></td>
<td>N</td>
<td>51</td>
<td>71</td>
<td>51</td>
<td>71</td>
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</tr>
</tbody>
</table>
Results indicate significant differences between OE and FTF formats for all five variables. Mean ratings were significantly higher (more positive) for FTF than for OE formats for Effectiveness ($F(1, 118) = 167.31, p < .000$; Interactions ($F (1, 117) = 545.72, p < .000$); Communication ($F (1,118) = 176.74, p < .000$; and Complex Ideas ($F (1, 119) = 167.31, p < .000$); but for Convenience, the mean was significantly higher for OE than for FTF ($F = 50.12, p < .000$). There was also a significant interaction between Experience and Format for Effectiveness ($F (1, 1, 119) = 8.35, p < .005$). There were no significant differences based on experience, and no other interaction between Experience and Format.

## 4 Conclusions and future work

Results indicate that students rate FTF education more positively than online education for all variables except convenience, which was rated more positively for online courses than for FTF. For effectiveness, there was an interaction effect. While the overall mean rating was higher for FTF and OE, for those with experience with OE, online courses were rated significantly more positively than for those with no experience. So, the experience of taking OE courses makes a small difference in perceptions of the course experience. However, the overwhelming message is that OE is a format of convenience, not an equivalent or improved delivery method. This suggests that much work remains to be done to maximize the usefulness of OE learning.

OE 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, education should be delivered wherever and whenever needed. In many cases, OE systems offer flexibility and convenience that can not be achieved by FTF classroom settings (e.g., a course recently co-taught by instructors in the U.S. and in China to students in both countries). One major problem with current OE systems is that they do not address the needs and wants of the users (instructors and students) effectively. OE systems are usually developed by designers who do not have a sufficient understanding of the learning process. We believe that by identifying the strengths of FTF instruction and developing techniques that allow OE to utilize the same strengths, it is possible that OE systems can exceed traditional FTF instruction. Furthermore, by using enhanced technology, we believe that “top” students will be more easily attracted to these courses. The findings of this study will provide a comprehensive guide for OE designers and for those who are responsible for the implementation of OE systems. The effectiveness of OE is crucial since education is likely to rely increasingly on OE in the near future.

As the world continues to shrink, it is absolutely essential that we know how to make OE work for all users. We need to know where we stand at present in order to determine where we go next. Members of this research team have plans to build an OE tool that will incorporate state-of-the-art elements such as 3-dimensional virtual reality engines and agent-based software design
technologies. The results of this survey provide the knowledge background for the next project. We plan to use the findings of this study to provide the basis for the team to build an OE system that will maximize the effectiveness of the OE experience for students and faculty.

References