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Introduction to Database Systems: Porting the Campus-Based Course to an Online Asynchronous Format

Meg Coffin Murray
mcmurray@kennesaw.edu

INTRODUCTION TO DATABASE SYSTEMS: PORTING THE CAMPUS-BASED COURSE TO AN ONLINE ASYNCHRONOUS FORMAT

Meg Coffin Murray
Kennesaw State University
mcmurray@kennesaw.edu

ABSTRACT

More and more courses are being ported to an asynchronous online format. Courses in which learning outcomes include mastery of a technology component, such as a database system, introduce additional challenges. This paper investigates student perceptions of the value of various types of instructional materials and methods for facilitating faculty contact utilized in an online introductory database course. The findings suggest that detailed online lecture notes have the most value with high ratings also given to narrated lecture notes and online interactive tutorials. Learning activities and assignments were also deemed to be extremely important with over eighty-nine percent of the students indicating preference for weekly assignments. The most common method used for faculty contact was email and students consistently cited that quick response turnaround and instructive feedback enhanced learning. In an online course, student learning can be enhanced by incorporating a variety of instructional materials and requiring students to frequently engage in structured learning activities.

Keywords

Online learning, asynchronous format, database, instructional materials

INTRODUCTION

Online courses are becoming more and more prevalent. According to the latest available data from the Sloan Consortium, more than 3.94 million students took an online course during the fall semester of 2007 representing more than twenty percent of US higher education students (Allen and Seaman, 2008). Eighty percent of these students were enrolled in an undergraduate course. Even institutions that traditionally offered only campus-based courses are porting courses to an online format. Typically online courses are offered in a synchronous, asynchronous or blended mode. In a synchronous course, students and teacher are separated by location but meet together at the same time. Technology, such as web or videoconferencing, supports the real-time interaction of the participants. The primary difference between a synchronous class and a campus-based class is distance. In an asynchronous course, students and teacher are separated by location and time. Course materials, activities, exercises and assessment instruments such as exams, are placed online whereby students engage with the materials independently. Interaction may be promoted through such activities as discussion forums but generally all coursework is done outside real-time interaction, i.e. asynchronously. A blended method incorporates both synchronous and asynchronous components. This paper investigates porting an introductory database class to an asynchronous online format.

There are many challenges to the development of an asynchronous online course. As Duke (2002) points out, there is more to the pedagogy than simply putting professors' lecture notes on the web. Oblinger and Hawkins (2006) site the need for the application of deliberate instructional design starting with the development of specific and targeted learning objectives that can be mapped to specific learning activities and measurable outcomes. Specifically they perceive that online courses must move from delivery of content to a series of 'learning environments and activities' of which interaction is a critical component. Henry and Meadows (2008) espouse that these learning activities must engage and immerse the student as well as put them in charge of their own learning and Krichen (2009) states that a variety of learning activities are needed to accommodate various student learning styles. While a range of factors contribute to a successful online course, the most critical factor is the design of the student learning experiences (Clear, Haataja, Meyer, Suhonen, Varden, 2001). The need for a well-designed and well-implemented online course inclusive of a variety of well-defined learning activities is especially pertinent when course learning outcomes include development of technological computing skills where students must demonstrate the act of doing as well as the act of knowing.

COURSE OVERVIEW

Most computing and information systems programs offer an introductory database course. The course generally requires students to develop conceptual and analytical skill related to data modeling and design as well as develop skill in database implementation and query building using an actual database technology. In an ideal situation, the course may even be taught in a computer lab or computer equipped classroom. The goal of this project was to port the introductory database class to an online format retaining the learning outcomes specified for the campus-based course. The course is offered as a sophomore level course with the only prerequisite being an introductory computing class. In other words, expectations of previous student interaction with or knowledge of computing technologies was limited. While the course is required for information systems majors, the course is opened to students in all disciplines. The course is focused on three areas, database design, introduction to the Structured Query Language (SQL) and topics related to multi-user databases such as transactions and concurrency, database security and database ethics. Specific learning outcomes state that upon completion of the course students will be able to:

- Describe and discuss the role of data and information in society, how that data is most commonly retained electronically and explain what a database management system does
- Model data relevant to a database task, given a written description, reports and other information from a system user -- results should be represented as an Entity-Relationship Diagram
- Transform the entity-relationship model into a logical design, following the relational approach
- Normalize a given set of tables to third normal form
- Compose working SQL statements for simple and intermediate queries.
- Build and modify a database schema using SQL
- Insert and modify data using SQL
- Define locking techniques used to control the consequences of concurrent data access
- Name and describe common database security issues and identify ways to address potential database security vulnerabilities
- State ethical guidelines for data collection for database projects.
- Use an integrated development environment such as Microsoft Access to construct a set of simple input forms and output reports.

Assessments included three exams and a comprehensive project. Several modifications were made in the instructional support, instructional materials and learning activities implemented in the online version of the course. Two forms of lecture notes were posted each week including both instructor-narrated and non-narrated detailed PowerPoint lecture notes. Learning activities were also assigned each week. These included online interactive tutorials, quizzes, online discussions and learning exercises. Students were required to install and use two different database technologies, Oracle 10g Express (free version of Oracle) and Microsoft Access 2007 provided to students through the Microsoft Academic Alliance (MSDNAA) program.

The first topic introduced in the course was database design specifically related to relational database systems. Concepts covered included entities and attributes, relationships, cardinality, constructing Entity Relationship Diagrams (ERDs), mapping ERDs to database tables and normalization. For each topic, students completed an online interactive software tutorial and either an online quiz or an exercise implementing the concepts under study. The interactive software tutorials utilized are included as modules in the Animated Database Courseware project, developed under a National Science Foundation curriculum development grant and made freely available at http://adbc.kennesaw.edu. As part of the learning exercises, students were required to construct ERDs. No specific drawing tool was mandated. However, a PowerPoint template composed of ERD symbols was provided as well as an instructional guide for using 'Gliffy.' Gliffy (http://www.gliffy.com) is an online drawing tool that allows users to create up to five diagrams free-of-charge.

The Structured Query Language (SQL) was presented in a graduated fashion beginning with development of queries on a single table, using joins on multiple related tables and finally using SQL to create tables and insert, update and delete data. As with database design, interactive software tutorials and weekly exercises were assigned. The tutorials included interactive software modules from the ADbC courseware as well as the freely available SQL tutorials provided by W3Schools

(http://www.w3schools.com). Initially, students were instructed to manually construct SQL statements and encouraged to use Oracle 10g Express to accomplish this. Query design features included in both Access and the browser-based window of Oracle 10g were later introduced accompanied by separate instructor developed instruction guides. Finally, students were exposed to the input form and output report features included with Microsoft Access as these were required components of the course project. In addition to supplemental materials provided with the text, students were given access to computer-based training modules on using Microsoft Access.

Other topics covered in the course included concurrency and transaction processing as well as database security and database ethics. Software animations from the ADbC site were used to demonstrate concurrency control utilizing various locking techniques. In the area of database security, ADbC animations were used to demonstrate access control, SQL injections, inference and database auditing. Database ethics was presented using various case-based scenarios. Students were asked to investigate and discuss the ethical issues presented in the cases through a forum provided in an online discussion board. Overall, the objective in the design of the online introductory database course was to guide students through the course material by utilizing a variety of instructional materials and requiring students to frequently engage in structured learning activities.

STUDENT PERCEPTIONS

At the close of the course, students were asked to complete an anonymous survey indicating their perceptions of the value of the various types of learning materials provided in the course and the effectiveness of the venues provided for faculty contact. Twenty-nine of the thirty-two students enrolled in the course responded to the survey. Students were asked to assess the importance of online lecture notes, online narrated lecture notes, online interactive tutorials, online discussions and assignments using a scale of 1-5; 5 representing the highest value. Students were also asked to state whether they felt assignments and participation in online discussions should be required on a weekly basis. Four of the five instructional materials included on the survey received a weighted average score greater than 4. Discussion forums received a lower rating; in fact more than half of the students rated this category as having no opinion, not important or not needed. Seventy – six percent of the students did not feel that weekly discussions were beneficial. All students rated the lecture notes as important with more than 86% stating they were extremely important. The narrated lecture notes were also seen as important, although a minority of respondents gave them a lower rating. In the free response section of the survey, two students indicated that the content provided in the non-narrated lecture notes met their learning needs so they did not need the additional support provided in the narrated notes. Other students indicated that the narration significantly added to their learning experience. While the majority of respondents rated the tutorials as extremely important, just over 20% were neutral in terms of their importance and another 3 students indicated they were not important. Again, articulated responses about the tutorials were mixed. Two students indicated that the tutorials were not particularly helpful while three students indicated they were extremely useful and one student even indicated a desire for more tutorials to be included in the course. All but one student rated the assignments as important or extremely important and when asked if assignments should be required weekly, 89% agreed. One student indicated that weekly assignments were needed to reinforce the concepts and another student indicated they helped to keep the student from falling behind. Table 1shows student responses giving the frequency, percentage and weighted average.

	Extremely Important		Important		No Opinion		Not Important		Not Needed		Weighted Average
Instructional Material:	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
Lecture Notes	25	86.21%	4	13.79%	0	0.00%	0	0.00%	0	0.00%	4.86
Narrated Lecture Notes	18	62.07%	5	17.24%	5	17.24%	1	3.45%	0	0.00%	4.38
Tutorials	16	55.17%	4	13.79%	6	20.69%	3	10.34%	0	0.00%	4.14
Assignments	17	58.62%	11	37.93%	1	3.45%	0	0.00%	0	0.00%	4.55
Discussion Forums	4	13.79%	8	27.59%	11	37.93%	4	13.79%	2	6.90%	3.28

Table 1. Student Perceptions of the Value of Various Instructional Materials

In an asynchronous online class, without the advantage of scheduled face-to-face class time, interaction between faculty and students is facilitated through electronic mediums. Studies indicate that faculty member accessibility, quick response times and quality interaction between faculty and student directly contribute to effective online learning experiences (Krichen, 2009). In this course, faculty accessibility was provided via email, telephone and weekly online 'virtual office hours' facilitated via an online chatroom. In addition, weekly physical office hours and a general class discussion board were made available. Table 2 represents student responses to their perceptions of the value of the online venues. Email received the highest rating, and in fact, was the most commonly used method for one-on-one faculty-student interaction. Approximately half of the students reported no opinion in terms of phone support with 26% indicating it was not important and one indicating it was not needed. During the semester, phone contact between faculty and student occurred six times. Virtual office hours were scheduled at the same time every week. During this time, students could login and participate in a real-time interactive session with the faculty member. The low weighted average received for the chatroom sessions is in keeping with the fact that this option was sparsely used by students. Most weeks, no students participated and during the course of the semester only three students ever logged into the chatroom during virtual office hours. It is interesting to note that no student indicated virtual office hours were not needed. Physical office hours were maintained but as with the virtual office hours, students did not take advantage of this method of contact. Students did participate in the general class discussion thread. Students were encouraged to post course related questions in this forum and also to respond to classmate inquiries. Most issues raised in this forum were related to course logistics such as questions about due dates or formats for assignment submission.

	Extremely Important		**Important**		**Neutral**		**Not Important**		**Not Needed**		**Weighted Average**
Faculty Contact Modes:	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
Email	22	75.86%	7	24.14%	0	0.00%	0	0.00%	0	0.00%	4.76
Phone	3	10.34%	5	17.24%	14	48.28%	6	20.69%	1	3.45%	3.10
Chatroom	1	3.45%	2	6.90%	18	62.07%	8	27.59%	0	0.00%	2.86

Table 2. Student Perceptions of the Value of Various Methods of Faculty Contact

CONCLUSION

Developing an asynchronous online course, especially one in which students are required to master a computing technology such as a database system is challenging. As Oblinger and Hawkins (2006) point out, it is more about creating a learning environment than putting a course online. The online learning environment has its own unique characteristics. Faculty – student interaction is separated by both time and location. This precludes the opportunity for immediate feedback as is afforded in the face-to-face physical classroom. Consequently it is not enough to simply provide students with content; online instruction must be designed such that students become actively engaged in pursuing the learning objectives. Further the role of the faculty member and the student change. The faculty member is no longer just a provider of content but a designer of student learning experiences (Seiber, 2005). The student must develop processes and methods to become an independent learner who builds skills in time-management, asking questions and staying motivated (Roper, 2007).

A core component of any online course will be found in the content provided. As indicated in this study, students identified the course lecture notes as the most important instructional material. However, the presentation, format and organization of the content are paramount to student success. There is less opportunity for students to ask for clarification so more detail must be provided and supplemental means to reinforce concepts are necessary. Online learning experiences must also require students to frequently engage in task-based activities and course-based assignments. Finally, quick turnaround to student questions and instructive feedback on course assignments contribute to enhanced learning as well as student satisfaction with the learning experience (Hopper and Harmon, 2000).

The demand for asynchronous courses will continue to increase. If for no other reason, they provide an opportunity to extend the reach of higher education in a format that can provide an effective learning experience. However, success depends on the purposeful and strategic design of course learning outcomes, course structure, course content, supplemental instructional materials and course learning activities. This requires deliberate and concerted effort on the part of the faculty member as an online course requires frequent faculty interaction, dialogue, mentoring and coaching (Oblinger and Hawkins, 2006).

REFERENCES:

1. Allen, I.E. and Seaman, J. (2008). Staying the course: Online education in the United States, 2008. The Sloan Consortium. Retrieved December 20, 2009 from http://www.sloanconsortium.org/publications/survey/pdf/staying_the_course.pdf
2. Animated Database Courseware. Retrieved December 20, 2009 from http://adbc.kennesaw.edu
3. Clear, T., Haataja, A., Meyer, J., Suhonen, J., and Varden, S. A. (2001). Dimensions of distance learning for computer education. *SIGCSE Bull.* 33, 2 (Jun. 2001), 101-110.
4. Duke, C. (2002) *Managing the Learning University*, SRHE and Open University Press, Buckingham, UK.
5. Gliffy – Online Diagram Software. Retrieved December 20, 2009 from http://www.gliffy.com
6. Henry, J. and Meadows, J. (2008, Winter). An absolutely riveting online course: Nine principles for excellence in web-based teaching. Canadian Journal of Learning and Technology, 34(1). Retrieved December 20, 2009 from http://www.cjlt.ca/index.php/cjlt/article/view/179/177
7. Hopper, K. B., & Harmon, S. W. (2000). A multiple-case study of exemplary internet courses. Education at a Distance 14(9). Retrieved December 20, 2009 from http://www.usdla.org/html/journal/SEP00_Issue/story04.htm
8. Krichen, J. P. (2009). Evolving online learning: can attention to learning styles make it more personal? In *Proceedings of the 10th ACM Conference on Sig-information Technology Education* (Fairfax, Virginia, USA, October 22 - 24, 2009). SIGITE '09. ACM, New York, NY, 8-12.
9. Oblinger, D. G., & Hawkins, B. L. (2006). The myth about online course development. *Educause Review*. Retrieved December 20, 2009 from http://www.educause.edu/ir/library/pdf/erm0617.pdf
10. Roper, A. R. (2007). How Students Develop Online Learning Skills. EDUCAUSE Quarterly, 30(1). Retrieved December 20, 2009 from http://connect.educause.edu/library/abstract/HowStudentsDevelopOn/40009?time=1189404960
11. Sieber, J. E. (2005). Misconceptions and realities about teaching online. *Science and Engineering Ethics*, 11(3).
12. W3Schools Online Web Tutorials. SQL Tutorial. Retrieved December 20, 2009 from http://www.w3schools.com/sql/default.asp