PURPOSE & OBJECTIVES

The purpose of this study was to determine if students in blended learning sections of GC120 performed as well in on several measures of performance as students in face-to-face sections. These measures included midterm and final exams and the solid modeling portions of the final project. We also wanted to examine general trends in how students navigated the online materials.

METHOD

Three sections of GC120, Foundations of Graphics (73 students), were taught as a blended instruction course. Content for the course was organized within a series of web-based lesson pages and was delivered in several formats. These included flash videos of voiced-over PowerPoints, sketching demonstrations, and SolidWorks demonstrations. Study guides were made available in a pdf format, and students were required each week to complete a 10-20 question WebCT Vista assessment.

The blended sections met face-to-face only once per week. The instructors used this time to discuss and demonstrate key solid modeling topics, check homework, and answer questions about assignments. Students were required to view the online content before coming to class. They also completed most of the sketching activities outside of class.
During the thirteenth week of class, students were asked to complete a confidential survey which was used as a formative evaluation of the course up to that point. The survey included the following questions:

1. Have you ever taken an online course?
2. Have you ever taken a hybrid course?
3. What is your instructional preference?
4. In what general order did you complete the online material related to the textbook?
5. If you were not required to complete the WebCT Vista assessments, what would be your approach for doing the readings?
6. In what general order did you complete the modeling assignments?
7. What is your preference for solid modeling instruction?
8. In what order did you complete the sketching assignments?
9. What is your academic year?
10. What is your major?

After the spring 2009 semester, two faculty examined samples of final projects from the blended sections and final projects from the face-to-face sections of GC120. The purpose of this exercise was to determine if students in the blended sections were modeling in SolidWorks as well as students in the face-to-face sections. The final project scoring rubric for the solid modeling and assembly portions of the project were used to evaluate these sample projects.

RESULTS

Students studied the textbook material twelve different ways. The top three strategies were:

1. Reviewed the textbook material and then completed the online assessment (25%).
2. Watched the streaming videos, read/reviewed the textbook, and then took the online assessment (16%).
3. Read and reviewed the textbook and then took the online assessment (15%).

Students completed the solid modeling assignments using 9 different strategies. The top three strategies were:

1. Took notes during the in-class demonstration, watched the streaming video demonstrations, modeled the object in the video, and then modeled the second assigned object (35%).
2. Watched the streaming video demonstration, modeled the object in the video, and then modeled the second assigned object (23%).
3. Modeled the object in the video while watching the video, and then modeled the second assigned object (7%).

There were 11 different strategies used by students to complete the sketching activities. The top three strategies were:

1. Started the sketching assignment in class, and then finished the assignment outside of class (39%).
2. Viewed some of the sketching videos, and then completed the assignment outside of class (17%).
3. Started the sketching assignment in class, viewed some of the online videos, and then completed the assignment outside of class (13%).
The midterm exam mean for the hybrid sections was 85.10 and the midterm exam mean for the face-to-face sections was 85.66. This difference was not significant at the $\alpha=0.05$ level. The final exam mean for the hybrid sections was 86.30 and the final exam mean for the face-to-face sections was 80.19. The analysis revealed that this difference was significant at the $\alpha=0.05$ level ($Z=4.7658$, $p<.0001$).

**CONCLUSIONS**

Students used multiple strategies for completing the assignments. The fall 2008 data revealed that more students elected not to use the online streaming videos to complete work. Thirty-nine percent of students used strategies for studying the textbook material that did not involve using the streaming media. This was up from 13% during the fall 2007 study. In the current study, less than 5% of students reported preparation strategies for the online assessments that did not include reading or reviewing the textbook. Less than 10% of students used strategies that did not include watching video demonstrations for the SolidWorks assignments. This was similar to the data from 2007. Approximately 46% of students did not view videos to help complete their sketching assignments. This was more than double the number of students from the fall 2007 study. The variable that might explain some of this variation was instructors of the sections. One instructor taught one section of the course in both studies. The instructor who taught in the fall 2007 study did not teach in the fall of 2008. The other two sections were taught by a third faculty member.

As with the previous study, links for the streaming media were organized on a course web page. Students could navigate through the materials in any order. Faculty was unable to track the order or the amount of time spent within the site. This also could account for the number of students who did not elect to use the online materials. Placing these links within a learning management system will allow faculty to track student progress more accurately.

The analysis of midterm exam scores revealed no difference between the hybrid and face-to-face sections. Students in the hybrid sections scored significantly higher on the final exam than students in the face-to-face sections. One possible explanation for finding a difference on the final exam and not the midterm may be based on the types of questions given on each exam. Since students in the hybrid sections completed weekly online assessments of between 10-20 multiple-choice items, it is possible that this practice gave them an edge over students in the face-to-face sections on the 100 multiple-choice question final exam. Only 25% of the midterm exam was multiple-choice items.

Results from the faculty evaluation of the sample projects revealed that students in the blended learning sections performed as well as students in the face-to-face sections on the SolidWorks portions of the project. It appears that the streaming media demonstrations of the SolidWorks activities were an effective way for students to learn the solid modeling and assembly modeling content during the semester.

**NEXT STEPS/LESSONS LEARNED**

Several changes have taken place since this study. First, all of the course materials have been migrated to the Moodle learning management system. This has allowed instructors to track student progress and created a more learner centered approach to the course.
Students have control over when they view the online content as well as options for viewing content more than once.

A second change is that we have moved a few of the GC120 sections from 24 seats to 60 seats. With this move we have increased the number of seats available to students during peak enrollment times. We have been able to do this by renovating a room in Poe Hall to handle laptop computers and by supplying the instructor with a teaching assistant.