

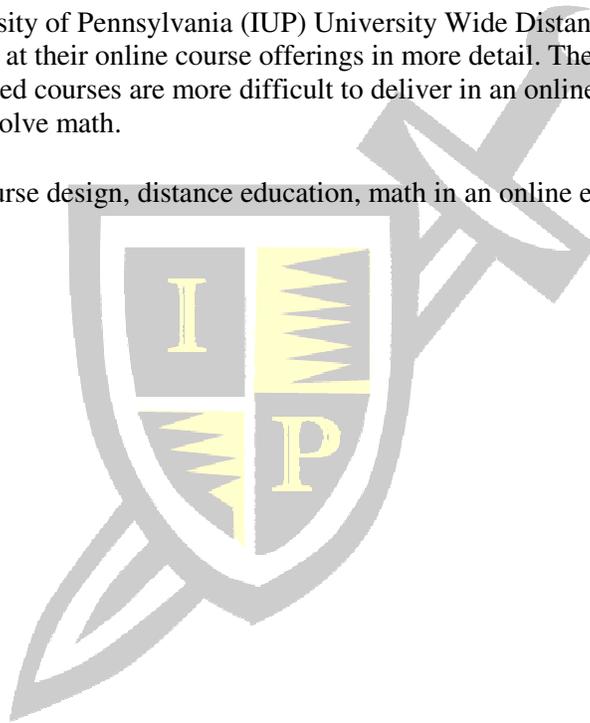
Issues in offering numeric based courses in an online environment

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Abstract

When developing online classrooms it is necessary to ensure that all learners will be successful in the course regardless of the topic or discipline that is being discussed. This becomes especially important when the class involves numerical data. This paper outlines the difficulty of delivering online classes such as algebra, accounting, and other courses that involve mathematical calculations. One of the authors of this paper currently sits on the Indiana University of Pennsylvania (IUP) University Wide Distance Education Committee that has begun to look at their online course offerings in more detail. The intent of this paper is to identify if number based courses are more difficult to deliver in an online setting as compared to classes that do not involve math.

Keywords: Online course design, distance education, math in an online environment, online withdrawal rates



Introduction

Delivering online courses involves different factors that contribute to the success of the course. Students who take online courses may face difficulty due the different learning styles involved in the virtual world. This difficulty increases in the case of online courses that involve numerical data such as math, accounting, and statistics. It is established that students taking such courses face a different set of challenges as compared to other online courses, thus special consideration must be given when designing these online class rooms.

This paper investigates the factors that make taking such online courses more difficult than other courses. It verifies whether taking numerical courses (such as math, accounting, and statistics) in an online setting is more difficult for the students as compared to other non numeric online courses. When working on the University Wide Distance Education Committee at IUP the author noticed a sharp increase in the amount of withdrawal in the 200-300 level courses. This committee has been looking into the various courses that are taken online and possible methods to increase student success and retention. In researching the classes offered online it was found that a majority of accounting, math, and numeric based courses were offered in the 200-300 level range. Thus it warrants investigating on whether this trend is common among all such courses. This paper intends to examine this trend and draw a conclusion based on the data collected for the purpose of this paper.

Issues with Math Based Online Classes

There are various issues that need to be dealt with when offering online courses. In math based courses, these issues have some specific characteristics that make the resulting scores unique to this category. As Wynegar and Fenster noted about this trend:

“Computer-Aided Instruction (CAI) received, on average, one-quarter a grade lower than their traditional lecture counterparts. Thus, the results supported Stephens and Konvalina (1999) findings that students do not perform significantly better when CAI was used as an instructional method.”

When reviewing the overall withdrawal rates of online students at IUP from 2003-2008 a large spike in 200-299 level courses was found. Students were more than twice as likely to withdrawal from a 200-299 level courses as compared to a 100-199 level and 300-399 level class. In addition, students were more than five times as likely to withdraw from a 200-299 level class as compared to a 400-499 level course. Several hypothesis were made when reviewing these results. Due to the students becoming more accustomed to online classes is was expected that the withdrawal rate would decrease from 100 to 400 level classes as it is expected that 400 level students would have prior experience within a distance education course. However there was little explanation for the drastic increase in 200 level online courses. These numbers were very interesting and demanded additional research. Table 1 below shows the withdraw rate for different courses classified by class level and by year of enrollment.

Table 1 – Withdrawal Range for Undergraduate Online Courses at IUP

Undergraduate Distance Ed Grades by Student and Class Level - 2003-2008								
Class Level	2003	2004	2005	2006	2007	2008	Average W %	Total
100-199	2288	1293	589	226	524	487	9.01%	5407
200-299	413	448	392	236	292	413	18.82%	2194
300-399	1096	1464	850	271	259	324	7.60%	4264
400-499	1010	652	298	82	87	82	3.71%	2211
Total	4807	3857	2129	815	1162	1306	9.78%	14076

To further examine the overall withdrawal rates each class level was examined by the specific course offered. A closer look at the percentage of withdrawals for each of the courses revealed additional data. Table 2 below shows all of the 200-299 courses offered in 2007. When studying the statistics for each 200-299 level course individually the reasoning for the spike was identified. As shown in Table 2, students who enrolled in 200-299 level online math courses were much more likely to withdrawal from the course. Over 32% of Business Statistics, almost 18% of Probability and Statistics, over 31% of Accounting Principles I, and over 29% of Accounting Principles II students withdrew from their online course. This was drastically higher than the five non numerical 200-299 online level classes where the average withdrawal rate was only 8.88%. If not for the high withdrawal rates in the 200-299 level online courses a consistent decline of withdrawals from 100 to 400 level courses would have occurred.

Table 2 – Percentage of Withdrawals by Courses 200-299

200-299 Level Math Courses in 2007	W% of Distance Education	W% of Traditional Education
Business Statistics 215	32.14%	12.39%
Intro to Probability & Statistics 217	17.98%	11.25%
Accounting Principles I 201	31.85%	11.04%
Accounting Principles II 202	29.20%	7.52%
200-299 Level Non-Math Courses in 2007		
Ethics 222	7.14%	7.43%
Intro to Sport Management 292	15.56%	5.88%
Legal Environment of Business 235	11.88%	4.05%
Marriage & Family Relations 224	7.14%	2.46%
Nutrition 212	3.57%	0.00%
Survey of Corrections 225	8.00%	5.00%

It should also be noted that there were no online classes offered in 300 and 400 level courses. There were twenty-two 100-199 online courses offered. Of these, four were numeric based courses as shown in Table 3 below. Of the 100-199 level numeric based courses offered in 2007, three of the four had higher withdrawal rates as compared to the overall average 9.01% as shown in Table 1 above. The average withdrawal rate for these four courses was 11.79%.

Table 3 – Percentage of Withdrawal by Courses 100-199

100-199 Level Math Courses in 2007	W% of Distance Education
Foundations of Math 101	11.11%
College Algebra 105	9.59%
Applied Math for Business 115	3.57%
Intermediate Algebra 100	33.33%

Methods to Help Improve Online Math Offerings

Online training can be developed using tools such as e-mail, discussions, chat rooms, Web casts, videos, and calendars available through an online learning platform. While each platform will have a different look and feel, the content, communication methods, and tools used to deliver the material will be similar.

There are numerous tools that faculty can incorporate into an online class to enhance a virtual classroom. Customized tools such as Flash interactive programs, screencasts, Web casts, simulators, and virtual labs enhance distance education classrooms. These tools provide unlimited possibilities when moving traditional classes into an online environment.

Study cards, training material, and class concepts can be designed using Flash interactive programs to help students learn the course material. These tools are designed to increase a student's knowledge of material that the course designer has shared for further review. Live meetings and screen sharing programs such as Breeze and Eluminate offer faculty the opportunity to interact with students in real time (Manczuk & Scordato, 2004). The tools provide students with another option to study course material outside of just reading notes or a text book.

Screencast programs such as Adobes Cam Studio and Captivate are extremely helpful when covering difficult concepts such as step-by-step procedures or processes. These tools provide recorded computer screen activities along with corresponding audio that the designer can use to help reinforce or explain certain concepts. Additional tools can then be used to edit the captured screencasts before they are shared with students (Dragan, 2005 & McMahon, 2007).

Simulators and virtual labs deliver the missing hands-on component for distance education courses. In the past it was extremely difficult to test the course objectives of a class that involved hands-on concepts such as network security, operating systems, computer hardware, and Web design. The use of simulators allows the opportunity to test a student's comprehension of technical concepts covered in lectures and text books. Simulators can ask questions throughout a process, or provide a report on the students' progress. Virtual lab programs allow students to log into a virtual machine where they see the actual interface or program being discussed. These programs provide a student real hands on experience that can not be offered in theory alone (Steadman, 2007). As Sunny Steadman of the Boston Business Journal explains:

“Adult students easily embrace simulations, because they enter business school with real-world experience in their repertoires, and they are comfortable with technology.”

Web casting, or podcasting, allows faculty the opportunity to record lectures so that students can review the material whenever they like, and as often as they choose. Web casting provides the opportunity to convert traditional online text lectures into streaming digital video and video files. While it is not recommend for all situations, short videos and clips can be a great aid in delivering difficult concepts or material that can not be explained with a text lecture (Philpot, 2006).

The tools chosen to convey the material should be presented in small manageable pieces that will hold the learner's attention while effectively delivering the necessary content. The online learning environment offers a means to share information twenty-four hours a day, seven days a week regardless of the learner's location. As a result the individual designing the class must make careful decisions regarding the platform and tools used to facilitate this continuous learning process. As Stow (2005) notes:

“One problem seen in distance education is the incorporation of only one type of interaction. Educators need to find a way to incorporate multiple methods of interaction in order to keep dialogue and structure at a suitable, level for both the students and the instructor”.

Screen and audio captures are beneficial when showing a step by step process on a computer screen. Adobes' CamStudio can be used to capture the screen and audio activity on a computer and will create “AVI video files using its built-in SWF Producer.” These files can then be saved as streaming flash videos and incorporated into the online

class room. This tool is free and can be downloaded online. Screenshots can also be taken through numerous free programs or through a Microsoft operating system such as 2000 Professional, XP, or Vista. These tools can be used to help give the student a visual and audio explanation of how to calculate complex mathematical formulas and problems.

The instructor may also choose to record their face to face lectures and share them with their online students (Young, 2008). An effective method for sharing videos and recordings can be accomplished through the Web site YouTube. Instructors may elect to record their lessons into short manageable three to four minute sections and upload them to a video sharing website such as YouTube. Instructors can also edit the video using the free Microsoft tool Windows Movie Maker. This tool is used to create and edit videos and can be downloaded for free online. Links to site can then be placed inside the course room so students can access and view the content through their Web browser. Instructors can upload and share videos by accessing their Web site.

As Talab (2008) noted:

“Professors are developing courses on YouTube, creating wiki-based syllabi that teach the uses of participatory media such as podcasting animated videos and developing online tools for scientific collaboration.”

“These digital learning opportunities create more positive attitudes toward the subject matter and increased opportunities for interaction and different learning styles.”

Summary

This paper investigated a trend in online courses at IUP. Specifically the trend researched if students at IUP were more likely to withdrawal from online numeric based courses as compared to non-numeric based courses. It was noticed that student were significantly more likely to withdrawal from numerical based courses such as math, accounting, and statistics. The data collected compared only the same courses offered in an online and face-to-face setting. The paper then recommended some strategies that can be implemented to help improve teaching online and student success in numeric based courses. These strategies include technological use as well pedagogical tools that help with teaching numeric based courses in an online setting.

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