AC 2012-3756: A FORMAL RESEARCH STUDY ON CORRELATING STUDENT ATTENDANCE TO STUDENT SUCCESS

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A Formal Research Study on
Correlating Student Attendance to Student Success

Abstract

A few years ago members of our Engineering & Design Department began a study to determine the effects of class attendance on student success. Today's engineering technology students have grown up in a very different environment from the students of 20 years ago. They access information and engage in social contact through digital media and they often have almost instant access to this digital media through portable, wireless devices. There is a thought that with this greater connectivity they may not respond in the same manner to the teaching methods of past generations of students. More specifically, the students of today may not feel the same need to be physically present in their classes in order to be successful. This paper discusses the first results of a study that allows the members of the Engineering & Design Department to determine if there is a significant relationship between student success and student attendance. Questions posed by this study include whether attendance has a correlation with student success and, if so, does this correlation change during the progression of a student throughout their undergraduate experience. The study will involve students in programs of Mechanical Engineering, Mechanical Engineering Technology, Computer Engineering Technology, Manufacturing Technology, Construction Management, and a service course to the general student body. Data comes from four different instructors teaching approximately 20 classes per year ranging from freshman to senior students. We continue to add to the project database creating a tool that we will utilize to study many different aspects of attendance and student success. This paper presents the results of a first assessment of the data, which show a strong correlation between attendance and success across freshman, sophomore, and junior levels. Some earlier studies suggest that student attendance for freshmen was better than that for juniors. This paper appears to contradict this idea in that at least for the classes used in this study student attendance improved measurably as they progressed from freshman to sophomore to junior standing.

Introduction

It is a continuing expectation among educators that students should attend class. It is assumed that a student will not progress in knowledge and understanding of a course topic without being in attendance to benefit from the classroom experience. However, with modern technology, students today are able to learn, access information, and interact with one another without sitting in a physical classroom, visiting a library, or even being in the presence of the friends they are communicating with. This begs the question as to whether the students of the modern "digital age" exhibit different learning styles from the past. Is a student's physical presence in the classroom as valuable today as it was in the past? Or, is classroom attendance optional for today's student, who is used to accessing information electronically?

Conceptual Framework of Student Attendance

It is generally accepted that attending class has a positive correlation with student success leading to a better understanding of the course material. This assumption is supported by a number of studies such as Clark, Gill, Walker and Whittle (2011)[4]; Cohn and Johnson (2006)[5]; Davidovitch and Soen (2003)[7]; Lin and Chen (2006)[10]; Silvestri (2003)[16]; van Schalkwyk, Menkveld, and Ruiters(2010)[19]; White, Thomas, Johnson and Hyde (2008)[21]; and Yao and Chiang (2011)[22]. An extensive literature review on this subject was recently done by Crede, Roch, and Kieszczynk (2010)[6], who concluded that class attendance was the best predictor of academic performance after reviewing 52 published papers and 16 unpublished papers or dissertations. Some studies have looked at if class standing is a predictor of class attendance. Clark , Gill, Walker and Whittle's (2011)[4] study discovered that first-year students attended lectures more frequently than third-year students. The lower attendance rate for third-year students was also noted by Cohn and Johnson (2006)[5].

Class attendance was one of the factors that students control leading to academic success as examined by Dollinger, Matyja, and Huber (2008)[8]; Yudko, Hirokawa, and Chi (2008)[23]; and Webb, Christian, and Armitage (2007)[20]. Incentives, penalties, and motivators for attending class were considered by Brooks, Burton, Cole, Miles, Torgerson, and Torgerson (2008)[3]; Gump (2005)[9]; Marburger (2006)[11]; and Moore (2005)[13].

Clark , Gill, Walker and Whittle's (2011)[4] study found a difference in overall performance of just over 7 percent between very strong attendees (90 % plus) and much weaker ones (less than 60%). One of the factors looked at by Allen (2009)[1] was the relation between choice of curriculum and excessive absences.

The current literature on how class attendance affects student success focuses primarily on non-engineering courses. Studies have been done on biology (Moore 2005)[13], business (Maskey 2011)[12], economics (Cohn and Johnson 2006[5]; Marburger 2006[11]), computer science (Urban-Lurain and Weinshank 2000[18] and Yao and Chiang 2011[22]), education (Silvestri 2003)[16], geology (Boss 2008)[2], political science (Tiruneh 2007)[17], and public finance (Lin and Chen 2006)[10], to name a few. However, little research has been done on the effects of class attendance on the academic success of engineering students.

With this in mind, a research project was initiated to determine the actual effects of class attendance on student success. While previous studies concentrated on non-engineering courses, this project focused entirely on courses taken by engineering, engineering technology and technology students. The objective was to determine if class attendance really leads to better grades. This study determined 1) if a correlation exists between class attendance and student success, and if so, to what extent, and 2) if and how student attendance patterns change as they go from freshman to junior.

Project Design

Since this project involves examining student success and attendance the first requirement was to define what was meant by 'student success'. For lack of any better assessment method it was

determined that a student's grade in a course would be the determining factor of their success in that course. Also tracking a student's attendance had to be agreed upon. Although it can generally be assumed that students who miss class for circumstances beyond their control might be impacted by the absence to a lesser or greater extent than those that simply choose not to attend, the decision was made to simply track attendance and not attempt to discern the reason for any absences.

It was also determined that for the results to be more generally applicable to engineering and technology programs and students that a broad selection of courses would need to be included. The courses selected for the study come from the Mechanical Engineering, Mechanical Engineering Technology, Manufacturing Technology, Design Technology, and Construction Management Technology programs. Additionally, there is data available from a technology course that satisfies a general education requirement at the university so students in this course come from a broad range of majors across campus.

Data from the courses involves tracking each student with a unique student identification number. This number will remain the same for the student across all of the courses. This means that data will be available for the class as a whole and on the individual level and that changes in a student's attendance pattern throughout their college experience can also be evaluated.

The courses were selected to give a representation of the various class instructional modes seen by Engineering Technology students (lecture-nonmathematical, lecture-mathematical, lecture/lab, lecture/demonstration). The project is also being conducted using four separate instructors who have agreed to participate in the project research. The use of more than a single instructor is an attempt to enable a more representative sample of the type of instruction that a student experiences during his/her academic career at the university. This use of multiple instructors will also help minimize the effect of a given instructors influence on student success. Among the different instructors there are also different approaches to attendance. One professor utilizes a requirement for attendance resulting in negative consequences for absences. Another utilizes a reward system. Another tracks attendance but neither rewards nor punishes students based on attendance. This spectrum of approaches to how attendance affects students' grades creates an additional opportunity to research what motivates a student to attend and to be successful.

Data has been gathered starting with January of 2009. The research study is currently ongoing. At the end of each quarter additional attendance information is added to the growing database. Because the database is extensive and spans multiple courses taught by multiple instructors, the researchers have the ability to track an individual student from their first course as a freshman until that student graduates. Currently the database holds over 1,600 entries. The only students not included in the following data are those who dropped out of the courses and those who arranged to receive an incomplete. At the time of this paper, there was not enough data to report on the performance of students who received incompletes.

Following is a description of each class and the mode and method of instruction.

TECH208 Survey of Electricity, is a traditional first lecture/lab course in electronics and electrical circuit analysis. The attendance is taken with a daily sign-in sheet. The course has a two-hour weekly laboratory.

TECH 393 Technology in World Civilization, is a traditional lecture-nonmathematical course. Attendance is taken through the use of a daily roll call. This is necessitated because the class is taught in one location and broadcast by simultaneous interactive television to three additional remote locations. This class is structured as four hours of lecture per week.

TECH 320 Non-Metallics is a lecture/laboratory mode of instruction. Attendance is taken through the use of a daily sign-in sheet. This class is structured as two hours of lecture and seven hours of lab per week.

ENGR 102 Introduction to Engineering Graphics serves as a pre-college skills course for students that come to the department without any previous high school or employment experience in technical drawings. The class is a lecture format. This class is unique in the study in that the grading is Pass/Fail. Attendance is taken daily by distributing a roll to the students requiring their initials to be marked as present.

ENGR 110 Engineering Graphics consists of both lecture and laboratory/demonstration periods. The laboratory/demonstration periods are interspersed with the lecture periods. Attendance is taken daily by distributing a roll to the students requiring their initials to be marked as present.

TECH 340 Statics uses a lecture-mathematical mode of course instruction. Attendance is taken with a daily sign-in sheet.

TECH 341 Strength of Materials is a lecture and mathematically intense course. Attendance is taken daily by distributing a roll to the students requiring their signature to be marked as present.

TECH 385 Robotics and Automated Systems is uses a lecture-laboratory mode of course instruction. Attendance is taken with a daily sign-in sheet.

By virtue of the course numbering system it can be seen that the makeup of tracked courses ranges from freshman to junior level. It should be noted that some of these 300-level courses constitute senior-level courses for students in many of the technology programs.

Project Outcomes

This paper reports the initial results from analyzing the data. In this first assessment the overall grade of a student in the various courses was analyzed along with the percentage of days that the student attended class. That data is shown in Table 1.0 below. The data from Table 1.0 is presented graphically in Figure 1.0.

Table 1.0, Summarized Attendance Data

All Records		
GPA ranges:	Number of Students	Percent of Attendance
0.0-1.9	86	55.40%
2.0-2.9	162	75.70%
3.0-3.9	809	84.81%
4.0	430	91.24%
FAILED	10	32.81%
PASS	189	74.15%
Total	1,686	
100 Level Graded Courses		
GPA ranges:	Number of Students	Percent of Attendance
0.0-1.9	22	37.42%
2.0-2.9	31	57.06%
3.0-3.9	75	68.92%
4.0	70	82.77%
FAILED	10	32.81%
PASS	189	74.15%
Total	397	
200 Level Graded Courses		
GPA ranges:	Number of Students	Percent of Attendance
0.0-1.9	8	46.64%
2.0-2.9	24	72.24%
3.0-3.9	120	84.50%
4.0	59	87.81%
FAILED	0	
PASS	0	
Total	211	
300 Level Graded Courses		
GPA ranges:	Number of Students	Percent of Attendance
0.0-1.9	54	63.56%
2.0-2.9	107	81.87%
3.0-3.9	608	86.75%
4.0	296	93.83%
FAILED	0	
PASS	0	
Total	1,065	

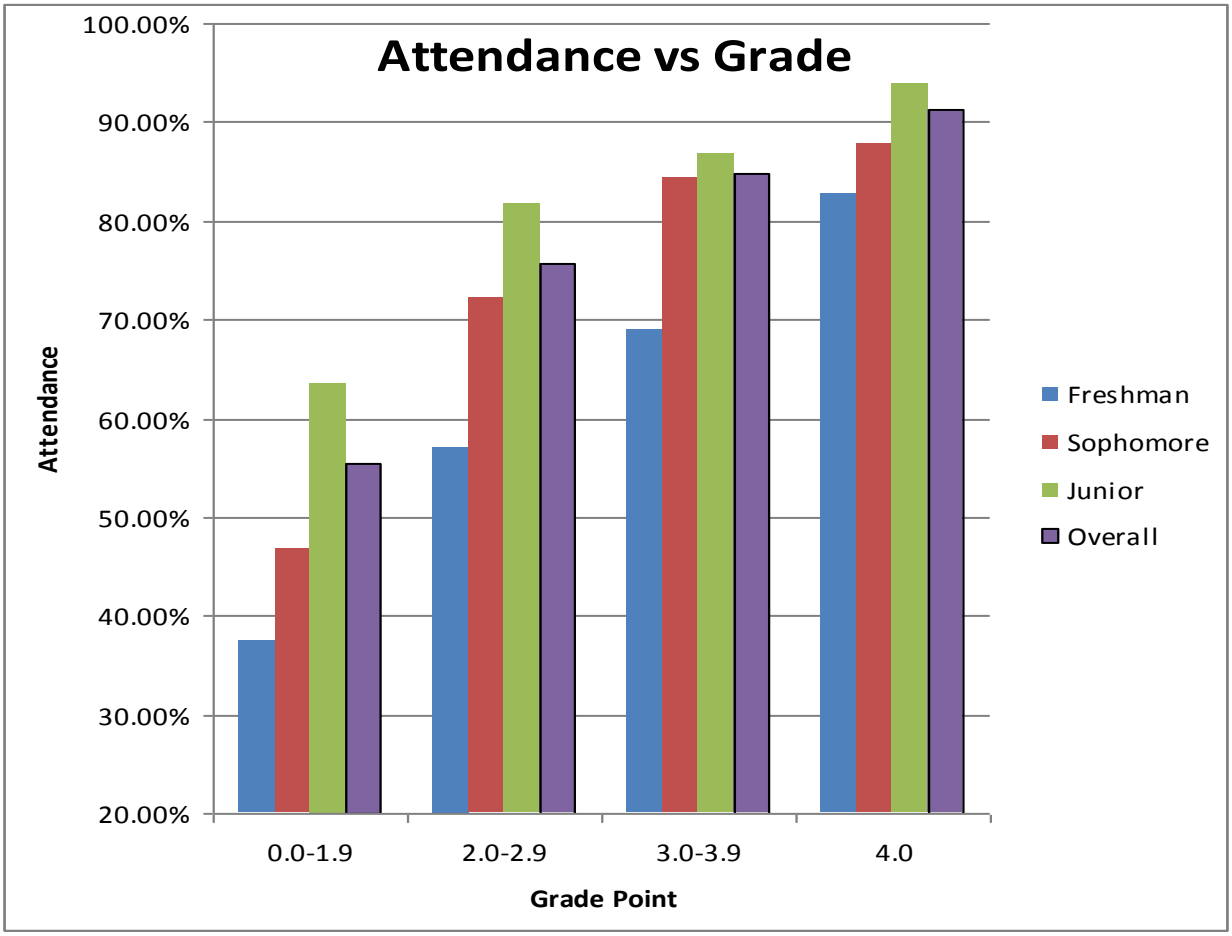

Figure 1.0, Attendance percentage versus student final Grade

To simplify the analysis the student's final grades were divided into four ranges: 0.0 to 1.9, 2.0 to 2.9, 3.0 to 3.9 and 4.0. Average attendance percentages within each grouping were plotted according to class standing. Additionally an average over all three classes was also included for each grade division. Unfortunately, data from 400-level courses was not a sufficient part of the database at the time of this first analysis.

Figure 1.0 illustrates three important results. First, all levels of students with higher percentages of attendance on average received better grades in the courses studied. The second result apparent in the graph contradicts results presented by Clark , Gill, Walker and Whittle (2011)[4] as well as Cohn and Johnson (2006)[5]. In their studies, they concluded that first year freshmen had better attendance than third year juniors. The results from our study are in direct opposition to those results. This presents an opportunity for further research into this area. The third result is that as a student moves through the curriculum and classes become more difficult, attendance becomes more important. In order to receive 2.0-2.9, a student had to attend at a level of 57% for classes at the 100-level, 72% for classes at the 200-level, and 81.87% for classes at the 300-level.

One anecdotal result was observed by one of the instructors in the study. Data from this instructor comes primarily from freshmen-level courses. This instructor takes attendance but it is not part of a student's grade. In other words, the student is neither punished nor directly rewarded based upon attendance. Passing a roll in class focuses attention on student attendance and requires the professor to clearly and frequently respond to student questions that attendance is not part of the class grade. We hope that future analysis will give a better insight as to whether observing attendance in these courses could possibly be altering the original conditions.

Project Update

There is a distinct lack of senior level course data in the study. Studies have been published that suggest that some seniors might disconnect from the school experience as they start to focus more on future employment and less on schoolwork. As previously mentioned some of the 300-level courses do constitute senior-level courses for students in many of the technology programs. However, to better assess the full college experience, additional courses at the 400-level were recentlyincluded in the project. When sufficient data from these courses has been added to the database, they will be included in future studies.

After the project began connections were made with the institutional research office at our university. This will allow future studies to include data on student ethnic backgrounds, gender, and financial aid status.

Conclusions and Future Plans

Initial results indicate that class attendance is positively correlated with a student's grade at the freshman, sophomore, and junior level. The authors realized that the data is lacking information at the senior level and corrected this by adding 400-level classes to the project.

None of the classes included in this project are currently taught online. If an appropriate online class becomes available, it will be added to the project. However, TECH 393 has a distance education element because it is taught on one campus and simultaneously broadcast to three remote locations. When there is enough data, the performance of the face-to-face students will be compared to the performance of the distance students.

This is an ongoing study. Additional information is added to the database at the end of each quarter. In addition to the above questions, the researchers on this project intend to use this data to examine such additional attendance related issues as:

- Does a student's attendance pattern change as they progress through the major?
- Does success early on lead to greater or less attendance in future courses?
- Is there a correlation between a student's major and his attendance patterns?
- Does a student's entering SAT score correlate to his attendance behavior?
- Are there differences in attendance patterns among different genders or ethnic groups?
- Does the time of year of the course affect attendance (fall, winter, spring)?
- Do students in certain majors have patterns of attendance different from others?
- Does the attendance penalty/neutrality/reward system affect attendance?

- Does the grading scheme (Pass/Fail vs. number grades) affect attendance?
- Does attendance vary based on the mode of instruction (lecture vs. lab)?
- How does our study relate to others in terms of student programs of study and the size of the project database?
-Does attending the first class have any correlation with the final grade?

We will evaluate these and other aspects related to attendance and student success in the future. We add data from the courses to the project database with each passing quarter and the database will continue to grow. The project team will publish results from future studies in hopes of establishing a useful dialogue in higher education on the aspects of attendance.

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