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A Look at the Current Status of Teaching Statics Online

Aiman Kuzmar, Ph. D., P. E.
Penn State fayette, Uniontown, Pennsylvania, USA, ask2@psu.edu

ABSTRACT

This paper focuses on the current status of teaching the subject of Statics by the online mode. Statics is a fundamental introductory course in many engineering disciplines. The course of Statics is briefly highlighted along with a list of the engineering programs that require it. The paper explains why many engineering instructors and engineering programs think or believe that teaching Statics online is not appropriate. It then explains the other point of view and explains why many other engineering instructors and engineering programs think or believe that teaching Statics online is a viable option. The paper examines the current status of teaching Statics online by providing a partial list of the universities which offer Statics online and those which do not. Some conclusions are then provided based on this limited study.

Keywords: Online Teaching, Distance Learning, Engineering Education, Statics.

1. INTRODUCTION

Despite its relative slow start, online education has become a very attractive mode of delivery for both institutes of higher education and students. It gives educational institutes more flexibility to offer more courses and more programs to attract more students in a world where competition among universities and colleges to enroll new students is escalating. Online delivery is also an effective means to meet growing budgetary challenges as all universities and colleges are under pressure to cut costs without decreasing enrollment. Online education gives students more freedom and flexibility to get an education without being physically present at their universities. This makes it very easy to work and study at the same time.

The huge advancements in technology have a profound positive impact on the exponential spread of distance learning. A quick look at the current state of online education testifies to this fact. Many universities and colleges are offering online education in many programs. In fact, it is indeed very difficult to find an institute of higher education in the US that does not offer online education in one form or another. The switch is on and online education is gaining popularity faster and faster.

Nonetheless, there are areas where online education is not acceptable as a mode of delivery yet. Many factors and reasons are responsible in this regard. Some educators and employers question the quality and even the validity of online education. The fact that it is easy nowadays to get fake online degrees adds to this skepticism. Such isolated unfortunate cases do not represent online education in general and should not be allowed to have a detrimental impact on online education. Certain mechanisms should be put in place to eliminate such practices.

Other educators including the author of this paper have more valid and legitimate concerns. These educators believe or think that online education is not appropriate in certain areas or certain courses in certain fields of education. For instance, there are those who totally oppose online education in the field of medicine while others see online education for parts of the medical schooling to be totally unacceptable.

In the field of engineering, many educators are still skeptical about online education in general while others have limited this point of view to certain courses. The author is this category. While believing that online education is a great and viable mode of education in general, he believes that fundamental first and second year engineering courses should not be taught online. A course in point is the subject of Statics which is the topic of this paper.

One way to establish or invalidate this specific concern about the suitability of Statics online teaching is to conduct an investigation. Investigating who teaches Statics and who do not was carried out. This paper is to highlight the finding of this look at the current status of online Statics education. Such an investigation is important because it will contribute to either support those who oppose teaching Statics online or to support those who promotes it.

2. THE SUBJECT OF STATICS

Statics is a very old subject (Hibbeler, 2007). It started deep in the B.C. era. For instance, Archimedes used Statics to study the lever (Hibbeler, 2007). Human beings used and are using the concepts of Statics in their daily lives. The fact that Statics is simple and it does not require sophisticated techniques made it easy to explore.

The science of mechanics studies the action of forces on bodies (Hibbeler, 2007). Fluid mechanics deals with fluids while solid mechanics deals with solids. Statics and dynamics are the two branches of solid mechanics. Statics deals with bodies that are in equilibrium. Equilibrium is the state where bodies are either stationary or moving with constant velocities.

Statics is an extremely fundamental course in many engineering fields. Without fully understanding its concepts, the students will not be able to understand further engineering concepts that depend on Statics. Many subsequent engineering courses depend heavily on Statics.

Learning Statics involves understanding fundamental concepts especially the concept of equilibrium and the ability to apply these concepts in subsequent design courses. Students learn how to handle forces and moments (loads) in both qualitative and quantitative ways and understand the effects of these forces and moments on the bodies they act on.

3. ENGINEERING PROGRAMS AND STATICS

Engineers apply sciences and mathematics to solve real life problems and to design products that benefit humanity (Moaveni, 2005; Ksky et. al., 2005; and Costello, 1993). The ways in which engineers apply scientific and mathematical tools define their engineering fields. Civil engineers, for instance, use physics and mathematics to design, build, and maintain structures like buildings and bridges, while mechanical engineers do the same with machines like automobiles.

3.1. STATICS IS ESSENTIAL

Statics is an essential course in the engineering disciplines which deal with forces. This includes the oldest branch of all engineering disciplines: the field of civil engineering. It also includes the large fields of mechanical and industrial engineering. Another field in which Statics is essential is the field of Aerospace engineering. These four branches alone make up half of the US engineering force (Wickert, 2006) according to data from the US Department of Labour. Other smaller size fields like mining, petroleum, nuclear engineering fields need Statics as well. This quick review highlights the importance of Statics in engineering as at least half of all engineering students must include Statics in their education.

3.2. STATICS IS NOT REQUIRED

Electrical and electronics engineering along with computer science and computer engineering graduates make up at least one quarter of the US engineering force. By nature, students in these four major engineering majors do

not need Statics in their education and they do not have to include it in their education plans. Another field that does not require Statics is the field of environmental engineering.

Nonetheless, many students in these fields opt to take Statics to satisfy their technical or other types of electives requirements. This is perhaps due to the appeal of this easy and practical subject to all students in general. This adds up to the significance of the subject of Statics.

4. TRADITIONAL ONE-ON-ONE VERSUS ONLINE EDUCATION FOR STATICS

As stated above, many educators believe that Statics should be taught using the traditional classroom setting. The main rational of this group is based on the assumption the students will not understand and comprehend Statics using the online mode. That is, the concepts in Statics will only be understood by the one-on-one mode and the physical interaction between the instructor and the students is critical. Statics deals with tangible concepts like forces: pull and push and that requires physical components that are not suitable for the online mode.

Available assessment on the effectiveness of teaching Statics online is simply insufficient to confirm the suitability of this mode of delivery for the specific course of Statics. This is true especially in the long term effectiveness. Most of the available evaluation reports focus on the willingness of the students to learn Statics online and on the ability to teach Statics online. It is not sufficient to confirm that students like this means of learning as students in general prefer online education for its flexibility and convenience. It is equally insufficient to show that it is possible to deliver Statics online because recent technological advancements have made it possible to almost perform any task online. True assessment should focus on whether this method achieves the objectives of the course or not.

The best true assessment is to engage a group of students to both the traditional and the online modes of teaching and then compare the results. This is not practical however at all as a student needs to take Statics only once in his/her education. Even if a group of students agrees to take Statics in these two modes of delivery for the sake of comparison, the study will be skewed. Any course is usually easier in the second round and this will affect the results of such evaluation study. This is exactly why such an evaluation study is not currently available in the literature. Recent reports are being published on the use of a hybrid mode of delivery in which parts of the Statics course is delivered using the traditional methods while other parts are performed online like the specific case with Statics at Miami University (Dollar, 2007). Assessment findings on this are not available yet.

Another possible evaluation scheme should involve teaching Statics to two groups of students simultaneously like the study performed at the Louisiana State University (Thiagarajan et. al., 2001). In this study, the Statics course was taught to a group of students using the traditional classroom setting while another remote group was also taking the same course using online technology. The study surveyed the two groups of students and concluded that the two modes of learning were statistically equivalent.

More evaluation reports are indeed needed in this regard. Assessment studies should also include the effect of teaching Statics by the online mode on the performance of the students in subsequent courses which depend on Statics. Perhaps, such studies can convince those who oppose teaching online Statics that distance learning is an acceptable mode in this regard.

Some educators think that students in certain majors like civil and mechanical engineering should not take Statics online because of the great importance of Statics in their major, but it is acceptable for students in other certain majors like agricultural and chemical engineering to study Statics online because Statics is not as important in such engineering fields. Further, this group does not oppose online Statics by students who take it as an elective course.

Many Statics educators on the other hand are increasingly becoming more interested in teaching Statics online. Distance learning has proven itself to be a very effective way of teaching due its convenience and practicality. Many other educators are simply responding to the mounting pressure of adopting online teaching. Many programs have to adapt to the evolving trends in education. Students are becoming more interested in online

education and institutes of higher education have to respond and adapt to these trends. If such institutes stay static and do not adapt, they may simply loose students and their programs may face serious consequences.

5. WHO OFFERS STATICS ONLINE

Until very recently, Statics has been entirely taught by the traditional classroom setting. Teaching online Statics was not an option indeed until the year 2000 or so when some institutes of higher education started to explore this possibility. Those institutes who offered Statics online were even doing so only on an experimental basis. Very few institutes have engaged in this kind of undertaking. This seems to be changing and it is changing rapidly. Statics is being offered online nowadays by several institutes of higher education worldwide and especially in the US. Examples are as follows.

The City College of San Francisco offers Statics online as ENGN 36. Statics is offered as ENGR 250 at Cuesta Community College in California while Reedley College offers it online as ENGR8. Thomas Edison State College offers Statics online as EGM-211. Outside the US, the University of Sydney is offering Statics online.

6. WHO DOES NOT OFFER STATICS ONLINE

A detailed investigation was made to see who do not offer Statics online. The list turned out to be rather very long. Despite the fact that several institutes have started to offer Statics online as stated above, the vast majority of universities and colleges are still not offering Statics via online. It is interesting to note that almost all of the investigated universities and colleges offer distance learning courses in other fields but not Statics. Many of them even offer various engineering courses, but again not including Statics despite the fact that it is one of the most fundamental engineering courses.

Listing all colleges and universities which do not have online Statics is not possible, but a partial list is possible. It is wise to alert the reader here that it is possible that some of these colleges and universities may have started this online Statics without reporting it. This partial list includes: the University of Texas at Austin, Stanford University, Georgia Tech, the University of California Berkley, the University of Florida, the MIT, Princeton University, Lehigh University, Rice University, Youngstown State University, the University of Houston, and Penn State University.

7. CARNEGIE MELLON UNIVERSITY AND ONLINE STATICS

Along with other academic institutes, the Carnegie Mellon University (CMU) is offering a free online Statics course within the Open Learning Initiative (OLI) which is generously supported by a grant from a famous foundation. This initiative includes several other courses besides Statics. The importance of this particular effort to us lies in the fact that a well known teaching and research institute like CMU is offering it.

8. SUMMARY AND CONCLUSIONS

This paper looked at the current status of teaching the subject of Statics by the online mode. It provided brief descriptions of this course and its significance in the engineering curricula. It was found that even though many educators have doubts about the suitability of the online mode of delivery with this specific course, many institutes have already established this option. Examples were given. Nonetheless, the majority of universities are still not offering Statics online. The author, who still believes that the traditional classroom is most suitable for Statics, predicts based on this investigation that more and more universities and colleges will offer Statics online and this will happen in the very near future. It is predicted that Statics will be easily available to everyone online in a few years time.

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