

Using Turning Technology (response system) in Teaching Statics

Mohammad Obadat

Department of Engineering
The University of Tennessee at Martin

Mohammad Ali Khasawneh

Civil Engineering Department
Jordan University of Science and Technology

Abstract

Statics is one of the early challenging courses for sophomore-level students at The University of Tennessee at Martin (UTM). In Statics, students are challenged to solve and analyze real life engineering-mechanics problems. On the other hand, instructors' challenge is to get the students to participate, focus, and understand the material during class periods. Turning Technology, LLC offers a response system that can get immediate students' participation and feedback. This interactive system is used along with PowerPoint slides to facilitate and try to improve students' learning experience in Statics at the Department of Engineering at UTM. The used technology was found to be useful, effective, simple to use and inexpensive tool. This response system was implemented in teaching Statics as an auxiliary tool along with multiple-choice questions on various topics each class time. The course-textbook supplementary material was used in class as the source of multiple-choice questions. The use of the response system was found to be effective in the following areas: students learning and understanding, Subject weakness points identification, students' preparedness for tests, and in students' interaction and collaboration. Also the response system helped in the evaluation of students' performance and in checking attendance. The use of Turningpoint 2008 Software generated instantaneous useful results for students' responses. The use of the response system technology was an exciting experience for both students and instructor and it helped students enhance the level of understanding for Statics. This paper shows some work on the implementation of the Turning Technology response system in teaching Statics.

Introduction

*Proceedings of the 2013 ASEE Gulf-Southwest Annual Conference,
The University of Texas at Arlington, March 21 – 23, 2013.
Copyright © 2013, American Society for Engineering Education*

One of the main challenges that instructors face is having students to interact and participate in classes. Students' engagement requires an effort from both students and instructors. Class interaction and engagement bring a spectrum of benefits to the students and to the learning process in general. It is thought that it will keep the students in an alert and focused mode, stimulate their thinking, and give some motivation. There are different ways and tools that are implemented in the educational area that try to get the students in the interaction environment. One of these methods is the response card system (clickers) that Turning Technologies, LLC developed. It has a variety of applications but share the same concept: open discussions, get feedback, and analyze the results. Audience can vary from K-12 to higher education and even businesses. This paper presents the utilization of this technology in the teaching process of a general engineering course-Statics as an interactive tool. Statics is offered at the Department of Engineering at The University of Tennessee at Martin as a required sophomore-level course. Most students view the Statics course as a challenging course. The authors attempted to test and utilize the response system hoping that it will ease and help in the learning process in a collaborative and dynamic approach.

Turning Technology Response System

The applied technology is developed by Turning Technologies, LLC. The three main components of this system are: the handheld response card (Clicker), receiver, and Turningpoint 2008 software (Figure 1).



Response card



Receiver



Software

Figure 1: The main components of the turning point technology

The response card has different buttons that can be used as needed. Cards have alpha/numeric buttons to answer questions appropriately¹. The cards communicate with the computer via a receiver that is plugged into the computer using a USB connection and uses a preset channel.

The software component of this system is the tool that collects, organizes, and presents the data and results. Two main types of software exist: Turningpoint 2008 and Turningpoint anywhere. The latter is a more generic program that offers the basic polling needs. Turningpoint 2008 is the latest software used that offers more features and components than Turningpoint anywhere. The setup and usage of the system is not difficult. More about the features of the system is presented in other sections of this paper.

Implementation

Each student is required to get his/her own response card that can be purchased from the bookstore on campus. Each card has a unique code that is assigned to it and therefore, each student info will be linked to that card. The University of Tennessee at Martin adopted the usage of this system and therefore got the full services provided by the manufacturer. One of the interesting features of the system is that it can be linked to Blackboard² used on campus. Blackboard offers an on line system for both instructors and students to interact and communicate. Course materials, discussions, and grades can be uploaded/downloaded from Blackboard. The response system was implemented in ENGR121-Statics class for the main objectives of getting students to better understand the difficult topics. The instruction strategy was to get the students involved, collaborative, dynamic, and all in an exciting environment. The form of multiple-choice questions (MCQ) in a PowerPoint environment was the main methodology of the implementation. The course-textbook supplementary material³ was used in class as the source of multiple-choice questions. An example of the questions given is shown in figure 2.

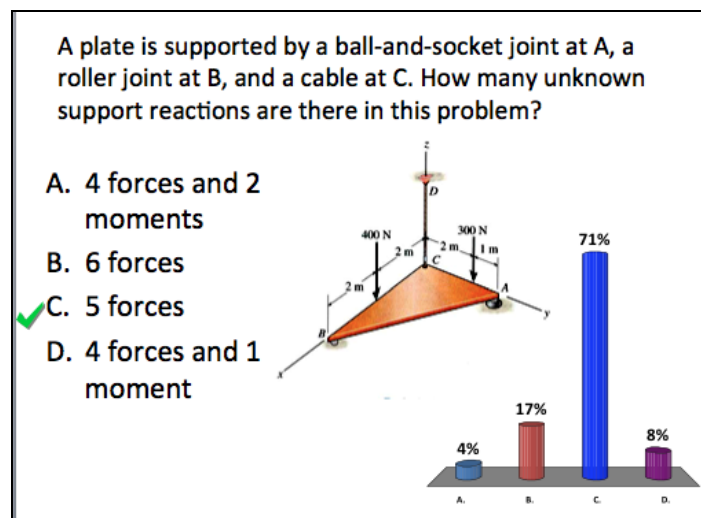


Figure 2 example of the MCQ with answers results

Each question is presented to the students and then a preset timer starts where all students can see. Once the time is up, the results as a percentage for each answered choice in the MCQ is shown as well as the correct answer. The questions covered the important concepts and topics in the material.

Results and Analysis

The results of the collected data can be exported to excel as seen in figure 3. Each answered question and responded answers are presented as a percentage from the total responders. It is also shown as a pie chart with the different answers. A unique feature of the software is that it can show the difficulty index for the questions given. The difficulty index is an assessment tool used by the software to determine the difficulty level of the problems given at a test. The difficulty index is the calculated based on the proportion of the students who answered the question correctly.

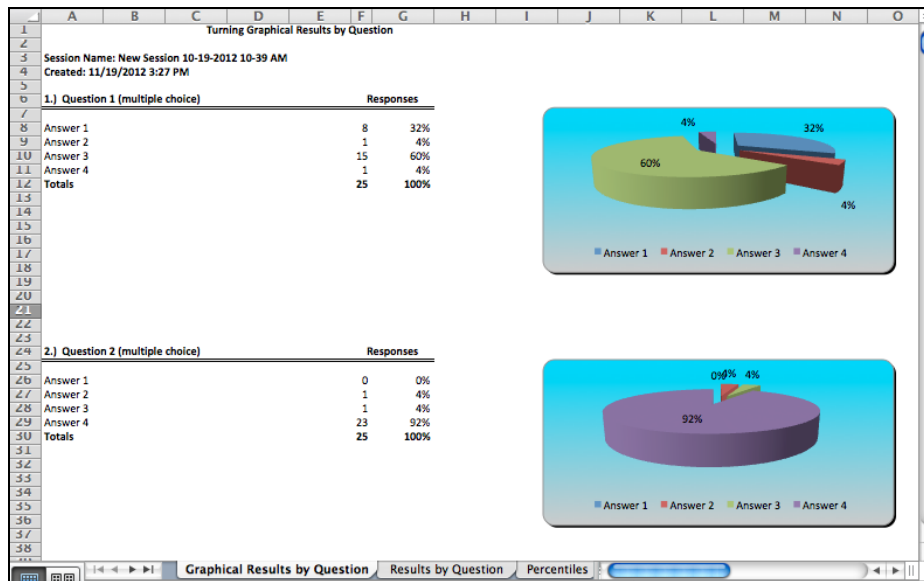


Figure 3 Results of answered MCQ's exported to excel

Screenshots of the questions and the student's answers can also be viewed as seen in figure 4. That feature is helpful for the instructor to identify the weak points or hard topics that students are having difficulty with.

Session Name: New Session 10-19-2012 10-39 AM.tpz
Created: 10/23/12 11:57 AM

1.) Question 1

Answer 1
Answer 2
Answer 3
Answer 4

Responses	
(percent)	(count)
32%	8
4%	1
60%	15
4%	1
Totals	100% 25

Figure 4 Results by question with screenshot

Individual students' answers can also be presented and summarized as seen in figure 5. Each answered question and the time for response are summarized. The answers can be graded instantly and a final grade can be given based on the correct answer.

Session Name: New Session 10-24-2012 10-57 AM.tpz
Created: 1/7/13 11:49 AM

Device ID: 2EA34C	First Name:	Last Name:	User Data:
Response	Time (in seconds)	Question	
3	7.20	1) Question 1	
4	11.65	2) Question 2	
3	26.45	3) Question 3	
2	31.32	4) Question 4	
3	14.70	5) Question 5	
2	19.24	6) Question 6	
4	15.65	7) Question 7	
3	14.54	8) Question 8	
3	8.34	9) Question 9	
2	6.18	10) Question 10	
4	11.15	11) Question 11	
2	9.89	12) Question 12	
2	17.19	13) Question 13	
-	-	14) Question 14	
4	2.82	15) Question 15	
5	4.50	16) Question 16	
3	6.8	17) Question 17	
4	7.95	18) Question 18	
2	7.67	19) Question 19	
3	5.90	20) Question 20	
3	44.87	21) Question 21	
2	11.55	22) Question 22	
4	14.18	23) Question 23	
2	11.45	24) Question 24	
2	6.78	25) Question 25	
4	18.84	26) Question 26	
1	10.46	27) Question 27	
3	23.9	28) Question 28	
2	12.62	29) Question 29	
3	4.86	30) Question 30	

Figure 5 Individual results for the answered questions

The answered results using the response system where utilized in different ways. The required info reached the students and the message was delivered in a style that got their attention. Students recognized correct answers and identified their possible errors and weak points. Students where corrected immediately for the mistakes they have made in approaching problems. Results where also used for checking students' attendance. All of the above conclusions were based on authors' observations in classroom and based on the students' feedback as described in the next section.

Students' Survey

A survey was used to get students' feedback on the implementation of the response system used in the course. Twenty-six students participated in the survey out of a total of thirty students in total. The ten questions asked in the survey are shown below. The answers with (yes or no) format along with students' responses are shown next to the questions as seen below. Students added notes and they are also shown at the end of the survey results.

1. Were the clickers hard to use? Yes <u> 0 </u> No <u> 26 </u>
2. Do you believe that clickers encouraged you to participate in class? Yes <u> 21 </u> No <u> 5 </u>
3. Was the time given to answer the questions (quizzes) given in class enough? Yes <u> 21 </u> No <u> 5 </u>
4. Did the statistics presented after each answered class tell you something about where you stand in class? Yes <u> 23 </u> No <u> 3 </u>
5. Did the (clickers) questions cover most of the important topics and concepts in class? Yes <u> 21 </u> No <u> 5 </u>
6. Did clickers' questions help you identify your weak points in the subjects? Yes <u> 21 </u> No <u> 5 </u>
7. Did clickers' questions help you prepare for tests? Yes <u> 13 </u> No <u> 13 </u>
8. Do you believe that it is fair if clickers are used to check your attendance? Yes <u> 23 </u> No <u> 3 </u>
9. Do you recommend the use of clickers in future classes? Yes <u> 24 </u> No <u> 2 </u>
10. Overall, Do you believe that clickers are useful interactive participation tool? Yes <u> 25 </u> No <u> 1 </u>

Figure 6 Students' survey for the use of the response system

The results of the survey showed a unanimous agreement that the adopted response technology was easy to use, encouraged participation in class, indicated student's stand in class, helped identifying weak points in subjects, fair tool to be used for attendance checking, and as a useful interactive participation tool.

Conclusion

The use of Turning Technology was an interesting experience that brought a new perspective for teaching Statics. This response-based system encouraged students' participation in a fun and dynamic environment. Students' found the tool helpful in clearing difficult definitions, and in pointing out their weak points in the subjects taught. Clickers results helped the instructor focus more on the topics that the students where challenged with. It gave an opportunity for the students to prepare for tests. The use of the response system was found to be helpful for student's interaction and collaboration in the classroom. Also it helped in the evaluation of students' performance and in checking attendance. Overall, The use of this response system might improve students' learning and understanding of Statics.

References

1. <http://www.turningtechnologies.com/>
2. <https://utm.blackboard.com/webapps/login/>
3. R.C. Hibbler, Engineering Mechanics: Statics or (Statics & dynamics), 12th ed., Prentice-Hall, 2010

MOHAMMAD OBADAT

Dr. Obadat serves as an Associate Professor of Engineering at the Department of Engineering at The University of Tennessee at Martin. His research interest is in Highway Materials and Non-Destructive Testing. Dr. Obadat is a member in the standing committee for Emerging Technologies in Transportation at the Transportation Research Board (TRB). Dr. Obadat is a registered Professional engineer in the state of Kentucky.

MOHAMMAD ALI KHASAWNEH

Dr. Khasawneh serves as an Assistant Professor in the Civil Engineering Department at Jordan University of Science and Technology. Dr. Khasawneh used to serve as an Assistant Professor at the University of Northern Ohio before moving into Jordan. Dr. Khasawneh is a registered Professional engineer in the state of Ohio.