Students' Opinions on Online Assessments in an Introductory Engineering Course

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Abstract—**Online education tools and course assessment tools available in web-based software like Blackboard have been becoming a more and more popular supplementation to traditional face-to-face classroom instruction. An example of these tools is Blackboard's assessment features that provide instructors with tools for building online assessments using different question types and different question options. The purpose of this work is to examine how students view online assessment in introductory engineering courses like statics. Quizzes and tests with mostly formula type questions were used for assessment in this study. Through the use of assessment tools and options available, tests and quizzes were designed so that each student obtained different versions of the exam or the quiz. At the end of semester, surveys were distributed to obtain student feedback on the assessment methods. The questionnaires were designed to obtain a student's response on effectiveness, scheduling, flexibility, and learning robustness, to name a few. As a result, this study found that students prefer certain aspects of online assessment. This assessment type allows students more freedom and flexibility in taking exams and quizzes, provides opportunities for self-improvement, and gives students timely feedback. Students also find this assessment type less stressful. The biggest drawbacks found for the students in this work were that there was no partial credit for problems that were partially correct as students would normally see on paper based assessments and the ease at which they felt their fellow classmates could cheat on these online assessments.**

I. INTRODUCTION

ONLINE education is gaining momentum throughout the world due to faster internet and availability of modern mobile technologies such as smart phones, PDA's, ipad's, tablets, etc. Engineering programs are still mostly face-to-face all over the US. However, there are some engineering programs in the US that are also offering some full online as well as hybrid engineering courses. Whether a program or a course is online or not, the tests or the quizzes can be given online to students to assess their performance. Research on online teaching and online assessments that replace traditional paper-based tests and quizzes have been a point of focus by many researchers. It is a very common tradition for many instructors to provide a quiz on material that he or she is going to cover next. That way the students can study and be prepared to comprehend the lecture effectively. A study [1] shows that engineering students are more engaged if they take online quizzes right before they come to class. Acceptance of online testing among engineering students may not be so much different from the online testing among students in any other discipline.

A study [2] was performed to investigate student perceptions regarding online testing in a managerial accounting course and they were found to be mixed with both positive and negative attitudes towards the testing. However, a similar study in engineering is highly scarce. One advantage for online testing is that the test takers can see their performance during or right after taking their tests or quizzes. A study [3] suggests that test takers perform better in computer-based tests since they can see their performance. To enhance the learning experience of students with technology besides desktop computers, PDA's and cell phones are now also being used in many institutes. A study [4] showed that a PDA-based quiz is more efficient compared to a paper-and-pencil based one in terms of the time it takes to finish the quiz.

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From the instructors' perspectives the use of online testing is somewhat mixed. A study [5] suggests that grading for online assessments are easier compared to the traditional ones; however, giving feedback to the students is just the opposite. From another instructor's perspective [6] an online testing is hard to setup, however, effective to provide feedback to the students in a personalized and timely manner.

In the current study, an effort is made to assess the acceptance of online assessments (tests/quizzes) among the engineering students for a statics class.

II. METHODOLOGY

Online assessments were given to a mid-size introductory engineering course such as Statics during the long summer of 2013. Formula-based problems were given to the students in the current study through the quizzes and the tests in Blackboard. The students were allowed to take those assessments during a specified time period outside of the regular class period. The formula-based questions were randomly generated for different students as well as for different attempts for the same student. That makes numerous versions of a test and as well makes it almost impossible to have identical tests for two different students. Students were allowed to take the tests or quizzes multiple times and each time a student took a quiz/test, he or she got a different version of that test/quiz.

A survey was conducted towards the end of the semester to see the acceptance of the Blackboard assessments as compared to the paper-based ones. The survey questions were given to the class of thirty-six students to obtain the perceptions of students towards the online testing through Blackboard. The Statics class where the survey was given was entirely a traditional face-to-face type class. The survey instrument was taken from a work related to introductory managerial accounting performed in a similar study [2]. The survey questions were slightly modified to fit the purpose of the current study. The survey results were discussed in details. The survey questions are shown in the appendix section of this paper.

III. RESULTS AND DISCUSSION

The survey results were found to be interesting. Students' responses to the survey questions are given here in Table 1.

Table 1: Survey results

#	Question	Score	#	Question	Score
1	When compared to paper-based tests that require writing or detailed computations, does computerized testing make the exam:	3.61	5	To what extent do you think that computerized testing affects a student's overall stress and anxiety levels?	4.03
2	To what extent do you think that computerized testing affects the scope (in other words, the quantity and type) of the material that can be used?	3.54	6	To what extent do you think that computerized testing affects the opportunity to cheat?	2.47
3	To what extent do you think that exams/quizzes administered in a computerized format affect the perception of the quality of the grade earned?	3.22	7	Computerized testing allows students to take an exam within a specified time frame or "window" of multiple days. In your opinion, do students taking the exam near the end of this period	2.92
4	To what extent do you consider the following factors to be positive or negative aspects of computerized testing in engineering		8	Computerized testing requires a student to look at a computer screen for an extended period of time. To what extent do you think that this affects test performance?	3.03
	a) Flexibility of scheduling and taking exams	4.69	9	Do you think that computerized testing limits making notes while taking the exam or quiz?	3.28

b) Permits more prompt feedback on exam performance than traditional paper-based testing	4.36	10	Do you think computerized testing limits a student's ability to quickly review the entire exam and budget time by guessing how much work is left?	3.42
c) Objective format permits educated guessing of answers	3.19	11	The speed of the computer or screen size may impact a student's ability to scan through the exam and review "answered" or "unanswered" questions. To what extent do you think this affects exam performance?	2.86
d) Elimination of essay questions or long-term problems	3.78	12	In a computerized testing a student can be allowed to take the test multiple times. Do you think the multiple attempts enhance the learning process and make a student skilled about the material covered in the test or quiz?	4.53
e) Elimination of judgment in grading (answer is either right or wrong)	3.22	13	In a computerized testing do you prefer to have multiple choice questions or putting a single numerical (calculated) answer in the answer box?	3.42
f) Elimination of partial credit in grading	2.44	14	Do you believe that separate tests or long-form problems, should be given in addition to computerized testing	3.28
g) Requirement that student be knowledgeable about computers	3.31	15	Do you believe that computerized testing accurately measures a student's learning?	3.75
h) Elimination of in-class return and review of exams	3.33	16	In the current computerized testing for a given problem only a single-part question can be asked. Do you prefer to have multi parts of the same problem?	3.25

The survey results are also shown in the following graph in Figure 1. It is noted that for all of the questions three represents neutral perception toward the online testing for a given question. Some of the results obtained were expected while others were not anticipated. Students' responses to the survey questions are discussed here in details. The first question students were asked was if paper based assessments are easier or if computer based assessments are easier. In this question it was expected that students would say that computer based assessments were easier than paper based. The result was a 3.61 indicating that students thought that computer based assessments are slightly easier than paper based assessments. The perception as to why it is easier is explained with the results of later questions. The second question asked students if computer based assessment expands or limits the scope (quantity and type) of material that can be covered in an assessment. Students surveyed felt that online assessment allowed for an increased scope of material that could be covered.

In the next question, students were asked how the computerized format affected the perception of the quality of the grade they earned. It was expected that the students would feel that the grade they earned was of the same quality whether it was paper based or computer based. However, students felt that the quality of their grade was higher with computer based assessments over paper based assessments. The next set of questions asked students if the factor was a positive or negative aspect of online assessment. The first factor was the flexibility of scheduling and taking online assessments. This is one question the students felt the strongest about. Students rated this 4.69 out of 5.00 indicating that they felt that the flexibility online assessment offered was a major positive factor. It allowed them to choose a time in a set time frame where they could sit down and take the online assessment at their convenience.
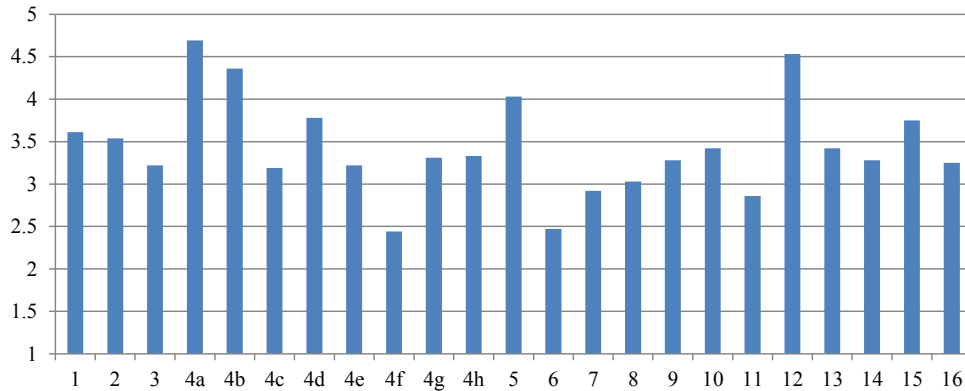
Fig. 1: Survey scores

The second factor they were asked about was the positivity or negativity of the prompt feedback available for online assessment versus traditional paper based assessment. Students also had a strong opinion on this and felt that this was a very positive aspect. This allowed them to know almost instantly if they were right or wrong in their answering of the questions. The next factor students were asked to rate as positive or negative was the ability to make an educated guess on the online format. Students said that this was a slightly positive aspect of the online assessments – if they did not know the answer they could look at the possible options and make an educated guess as to what the correct answer might be. The next factor that the students rated was if the elimination of essay and long problems on online assessment was positive or negative. Students felt that this factor was somewhat positive, rating it a 3.78 out of 5.00.

The next factor on the survey to be rated as positive or negative was the elimination in judgement of grading, either the answer is correct or it is wrong, no gray area in between. Students felt that this was a slightly positive factor in online assessment. The next factor student were asked about on the survey was the elimination of partial credit for partially correct answers. As expected students felt that this was one of the major drawbacks of online assessments. Students rated this question a 2.44 out of 5.00 showing a negative aspect. The next factor asked the students if needing a working knowledge of computers was a negative or positive factor of online assessments. Students felt here that students need to be somewhat knowledgeable about computers in order to be successful at online assessments.

The final factor that students were asked to rate as a positive or negative aspect of online assessments was if the elimination of in-class return and review of exams was a positive or negative aspect of online assessment. It was expected that students would see this as a big drawback of online assessment but the survey showed that students felt that this was a slightly positive aspect of online assessment. It could be that students feel that in-class return and review of exams is a waste of time since students receive their grade and feedback almost instantly on an online assessment. The next question students were asked on the survey was how much online assessments increased or decreased their stress. Students clearly indicated that they felt online assessment reduced their stress levels in comparison to paper based assessments.

The sixth question on the survey asked students if they felt that online assessment made it easier or harder to cheat. Students indicated that it was slightly easier to cheat on online assessment than it was to cheat on paper based assessment. The next question students were asked was if they felt that taking the assessment at the beginning of the time period gave an advantage or if taking the assessment at the end of the given time period gave an advantage. This question was asked hoping that students would not find any advantage one way or the other. In this survey it was neutral. If it was not neutral this is something that would need to be looked at much closer. The next question asked the students if looking at the computer screen for long periods of time while taking an online assessment had a negative or positive effect on their performance. This question was also asked hoping that students would not find it as having a negative or positive effect on his/her performance. In this survey it indeed was found

to be neutral. Again as stated for the previous question, if this had come out as a negative or positive it would warrant further investigation.

Question number nine asked the students being surveyed if they felt that online assessment limited their ability to take notes while doing the assessment. Students responded that they slightly disagree that it limited their ability to take notes. The next question on the survey asked students if computerized testing limited their ability to quickly review the entire exam and budget time by guessing how much work was left. Students responded that they felt that in an online exam seeing all the questions on the screen from the beginning actually helped them to more quickly review the entire exam and budget their time more quickly by estimating how much work was left.

The next question of the survey asked students about how computer speed and screen size affect their performance. Students responded saying that it had a slight negative effect indicating that computer speed and screen size are important when taking an online assessment. The next question was a very important question. This question asked students if multiple attempts enhanced their learning process and made them more skilled about the material covered in the test or quiz. For this question it was expected that students would agree that it increases student learning. This was the exact response that was found through the survey with a response of 4.53 out of 5.00. This happens because the students are allowed to take the online assessment many times. Each time the student takes the assessment they get a different set of questions so this forces the students to practice the material as well as the procedure needed to correctly solve the problem. Each time a student works through the question in hope of getting a higher grade they are gaining more mastery over the type of question being asked.

The thirteenth question on the survey asked students if they preferred multiple choice type questions or a single numerical answer question. In this question it was found that students prefer multiple choice type questions over numerical questions. It has been assumed that this is because students prefer the multiple choice questions because in multiple choice questions there are no calculations involved that could lead to a wrong answer from something as simple as a rounding error. As well students would be able to make an educated guess if they did not know the answer in multiple choice type questions.

The next question the survey asked students was if they thought a separate test should be given for long problems. The results from the survey indicated that students did not have a preference if an additional assessment was given for long problems or not given for long problems. The next to last question students were asked on the survey was if they believed that online student assessment accurately measured their learning. Students responded with an average answer of 3.75 indicating that they felt that the online assessment almost accurately measured their learning. The last question listed on the survey for students to respond to asked them if they preferred to have multi parts in the same problem where if someone answered one part incorrectly still on the other part(s) he/she may answer them correctly or if they preferred the current one problem part per question. Students responded to this question saying that they had no preference if it was in one question or in multiple questions.

At the end of the survey students were given an area where they could feel free to make comments. All of the comments were read and most of the comments were from students supporting the multiple attempts and how it helped them to master the material more. (Note: comments were written exactly as students wrote them.) For example, Student 7 said, "…I personally have been able to relearn and discover errors in my work because of the option of multiple attempts, therefore increasing my understanding of the subject matter…". Another comment from Student 8 said, "…multiple tries made me better understand the problem intricately…". Student 9 also said, "… with multiple attempts I take longer on exams and it truly forces me to understand the material…". Student 26 said that they liked immediate feedback offered by online assessments because, "… I believe online testing can give immediate feedback so that the student may correct or continue to work on problems they got wrong…". A final comment worth mentioning came from Student 33 said, "…I really like computerized testing because we have several attempts. Find because of this we can practice and learn more."

IV.   CONCLUSIONS

To summarize here the most important parts of the survey were that students felt that online assessment was easier because it gave them flexibility in when they could take the exam, it was easier because it reduced their stress in taking the assessment, and that online assessments offered almost instant feedback on how they were performing. Also, students felt that taking online assessments greatly increased their learning and mastery of the material being covered. The biggest drawbacks that the students found were that there was no partial credit for partially correct answers, that it was easier to cheat on online assessments than

paper based assessments, and that the computer speed and screen size if not fast enough and big enough could have a negative effect on their performance. Overall the students had a more positive attitude than negative attitude towards online testing supported by the survey answers and the comments made by the students.

APPENDIX

Table 2: Survey questionnaire

Course: Statics		Instructor:			Date:	
1	When compared to paper-based tests that require writing or detailed computations, does computerized testing make the exam:	Much more difficult	More difficult	No effect on difficulty	Easier	Much easier
		1	2	3	4	5
2	To what extent do you think that computerized testing affects the scope (in other words, the quantity and type) of the material that can be used?	Strongly limits scope	Limits scope	No effect on scope	Expands scope	Strongly expands scope
		1	2	3	4	5
3	To what extent do you think that exams/quizzes administered in a computerized format affect the perception of the quality of the grade earned.	Strongly weakens perception of quality	Weakens perception of quality	No effect on perception of quality	Improves perception of quality	Strongly improves perception of quality
		1	2	3	4	5
4	To what extent do you consider the following factors to be positive or negative aspects of computerized testing in engineering	Very negative	Negative	Neither positive or negative	Positive	Very positive
		1	2	3	4	5
	a) Flexibility of scheduling and taking exams	1	2	3	4	5
	b) Permits more prompt feedback on exam performance than traditional paper-based testing	1	2	3	4	5
	c) Objective format permits educated guessing of answers	1	2	3	4	5
	d) Elimination of essay questions or long-term problems	1	2	3	4	5
	e) Elimination of judgment in grading (answer is either right or wrong)	1	2	3	4	5

	f) Elimination of partial credit in grading	1	2	3	4	5
	g) Requirement that student be knowledgeable about computers	1	2	3	4	5
	h) Elimination of in-class return and review of exams	1	2	3	4	5
5	To what extent do you think that computerized testing affects a student's overall stress and anxiety levels?	Strongly adds stress	Adds stress	No effect on stress	Reduces stress	Strongly reduces stress
		1	2	3	4	5
6	To what extent do you think that computerized testing affects the opportunity to cheat?	Much easier to cheat	Easier to cheat	No effect on cheating	Difficult to cheat	Much more difficult to cheat
		1	2	3	4	5
7	Computerized testing allows students to take an exam within a specified time frame or "window" of multiple days. In your opinion, do students taking the exam near the end of this period	Have a strong disadvantage compared to those taking it earlier	Have a disadvantage compared to those taking it earlier	Have neither an advantage or disadvantage compared to those taking it earlier	Have an advantage compared to those taking it earlier	Have a strong advantage compared to those taking it earlier
		1	2	3	4	5
8	Computerized testing requires a student to look at a computer screen for an extended period of time. To what extent do you think that this affects test performance?	Very negative effect on test performance	Negative effect on test performance	No effect on test performance	Positive effect on test performance	Very positive effect on test performance
		1	2	3	4	5
9	Do you think that computerized testing limits making notes while taking the exam or quiz?	Strongly agree that taking notes is limited	Agree that taking notes is limited	No effect on taking notes	Disagree that taking notes is limited	Strongly disagree that taking notes is limited
		1	2	3	4	5
10	Do you think computerized testing limits a student's ability to quickly review the entire exam and budget time by guessing how much work is left?	Strongly decreases the ability to quickly review the exam	Decreases the ability to quickly review the exam	No difference between online testing and paper-based testing in terms of reviewing the exam	Increases the ability to quickly review the exam	Strongly increases the ability to quickly review the exam
		1	2	3	4	5

11	The speed of the computer or screen size may impact a student's ability to scan through the exam and review "answered" or "unanswered" questions. To what extent do you think this affects exam performance?	Very negative effect on test performance	Negative effect on test performance	No effect on test performance	Positive effect on test performance	Very Positive effect on test performance
		1	2	3	4	5
12	In a computerized testing a student can be allowed to take the test multiple times. Do you think the multiple attempts enhance the learning process and make a student skilled about the material covered in the test or quiz?	I strongly disagree that it will increase student learning	I disagree that it will increase student learning	No effect on student learning	I agree that it will increase student learning	I strongly agree that it will increase student learning
		1	2	3	4	5
13	In a computerized testing do you prefer to have multiple choice questions or putting a single numerical (calculated) answer in the answer box?	I strongly prefer a single numerical answer to be typed in the answer box	I prefer a single numerical answer to be typed in the answer box	I do not have any preference	I prefer multiple choice type questions	I strongly prefer multiple choice type questions
		1	2	3	4	5
14	Do you believe that separate tests or long-form problems, should be given in addition to computerized testing	I strongly believe a separate test should be given	I believe a separate test should be given	I do not have any preference	I believe a separate test should not be given	I strongly believe a separate test should not be given
		1	2	3	4	5
15	Do you believe that computerized testing accurately measures a student's learning?	I strongly disbelieve it accurately measures learning	I disbelieve it accurately measures learning	I do not have any preference	I believe it accurately measures learning	I strongly believe it accurately measures learning
		1	2	3	4	5
16	In the current computerized testing for a given problem only a single-part question can be asked. Do you prefer to have multi parts of the same problem? For a multi-part	I strongly prefer to answer single-part questions	I prefer to answer single-part questions	I do not have any preference	I prefer to answer multiple-part questions	I strongly prefer to answer multiple-part questions
		1	2	3	4	5

	problem if someone answers a part incorrectly, still the other part(s) he/she may answer correctly. Example of a multi-part problem: The sides of a rectangular block are given as 2 m, 3 m, and 4 m. Find a) the total surface area of the block and b) the volume of the block.				
17	Please use the following space to provide comments or to explain answers to your questions. We are very interested in knowing your perceptions.				

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