

IMPROVING ENGINEERING STUDENTS' PERFORMANCE IN HIGHER MATHEMATICS SUBJECTS AT THE UNIVERSITY OF EASTERN PHILIPPINES, CATARMAN, NORTHERN SAMAR PHILIPPINES, THROUGH SCREENING EXAMINATION

Benjamin D Varela

University of Eastern Philippines
Philippines
<benjaminvarela63@yahoo.com>

Abstract

Students' performance in higher engineering mathematics subjects at the University of Eastern Philippines was very poor from School Year 2003 – 2004 to School Year 2006–2007. This resulted in high dropout rate of students and unmotivated professors. This scenario prompted the researcher to formulate the screening examination strategy, wherein a retention score is prescribed aside from the passing score. A study was conducted to assess whether said strategy will improve students' performance in higher engineering mathematics subjects. This study will help second and third year engineering students improve their academic performance. So the researcher, starting School Year 2010–2011, reformulated his long examinations into screening examinations. The results revealed that the screening examination strategy increased the passing percentage of students in higher engineering mathematics subjects. The conduct of screening examinations implies that students are afraid to be screened out and so they will study well.

Keywords: Retention score; Screening examination; Integral calculus; Differential equations

Introduction

Prior to Second Semester, SY 2010–2011, the researcher had been assessing students' performance by the traditional long examinations wherein a passing score only, usually 50 – 60 points for a 100-item examination, is prescribed. Generally, less than 25% of the total number of students obtains the passing score and almost 50% of the students have scores below 25 and about 10% of the students gets zero. The worst thing is the carefree attitude of the low performing students who consistently get very low scores in all long examinations. As a consequence, higher mathematics professors become frustrated on their students' performance, lose their self-confidence, and become unmotivated to teach well. This scenario prompted the researcher to find another students' performance assessment strategy that will encourage students to study and one that will motivate the faculty members to teach well. Hence, the researcher reformulated his traditional long examinations into screening examinations, wherein a minimum score, termed as retention score, should be attained by the students in order to stay as an active member of the class.

Generally, the conduct of this study was aimed at assessing whether the screening examination strategy will be able to improve the performance of engineering students in higher mathematics subjects.

Specifically, this study was aimed to:

1. Assess the students' performance in higher mathematics subjects as indicated by the passing percentage for three (3) consecutive school years (2003–2004 to 2005–2006) when long examinations were conducted with a prescribed passing score only;
2. Assess the students' performance in higher mathematics subjects as indicated by the passing percentage for three (3) consecutive school years (2010–2011 to 2012–2013) when long examinations were conducted with a prescribed retention score (screening examination strategy) in addition to the prescribed passing score;
3. Determine whether the conduct of the screening examination strategy has increased (improved) the passing percentage in the higher mathematics subjects; and
4. Know the advantages and disadvantages of conducting the screening examination.

Background

The researcher observed that many engineering students fail in higher mathematics subjects due to either very insufficient knowledge of the prerequisite subject/s, very slow understanding of mathematical concepts, or laziness to study. Further, he observed that the low performers do not exert effort to improve their performance in the examinations. Their scores remain very low that their professor becomes frustrated and disgusted in teaching higher engineering mathematics subjects. These observations prompted the researcher to think of a strategy that will encourage students to study well, improve their performance from the first to the last long examination until they obtain a passing score.

The researcher realized that students will probably exert their best efforts if only to avoid being dropped from their class. So he thought of making every long examination a screening examination wherein students will be dropped from the class when their scores fall below a prescribed retention score aside from the usual passing score.

This screening examination is the usual long examination which the researcher would usually conduct after discussing a chapter or even just half of it. However, unlike the traditional long examination wherein only a passing score is prescribed, the screening examination strategy prescribes a minimum score, termed as retention score, that the students should obtain in the examination in order for them to be allowed to continue attending the class as regular students even if they don't obtain yet a passing score. During the first year of implementation, the researcher prescribed a retention score of 6–10 points only out of 100 points. This is increased to 10–15 points out of 100 points in the second screening examination and increased slowly until the last screening examination (usually the fifth) when the retention score is already equal to the passing score. Hence, the retention score is increased slowly so that the students do not get pressured of getting a passing score immediately.

Screening examination has been instituted in order to motivate students to study well, to obtain a score in the examination that is, at least, equal to or higher than the prescribed retention score, and to avoid shame from being screened out. This practice is anchored on the fact that a student will do his/her best to avoid from being put to a shameful situation. Current research by Johnson (2012) suggests shame as a factor in student learning. Pan (1993) wrote that the feeling of shame certainly did not inhibit a student from approaching an achievable task

Furthermore, in a website article entitled "Motivating Students to Learn" at www.essortment.com/motivatingstudents-learn-39970.html, it is agreed that, for school purposes at least, there are two types of motivation – the extrinsic motivation and the intrinsic motivation. Extrinsic motivation usually derives from external rewards - prizes, grades, tokens and wanting to do better than others. This leads to students performing solely for these rewards or to avoid shame or embarrassment.

Target Group

The conduct of screening examination was designed to benefit second and third year students taking higher engineering mathematics in the College of Engineering, University of Eastern

Philippines, especially Differential Calculus, Integral Calculus and Differential Equations. The researcher finds it very important to screen out slow learners in said subjects because these are the prerequisites to the taking of major subjects. A very weak performance in these subjects will most likely result in very poor performance in the major subjects.

Implementations and Discussions

The Screening Examination

Starting Second Semester, SY 2010-2011, the researcher implemented the Screening Examination to assess the class performance of his students in Integral Calculus. He was fully convinced that the screening examination will push students to study harder and avoid being screened out from his class.

In that particular integral calculus class during the Second Semester, SY 2010–2011, the researcher undertook the traditional first long examination with a required passing score of 60. The examination results was not quite good because about 30% of the students got scores less than 10, he felt disturbed and he realized the need to help the students to raise their examination scores nearer to or even higher than the required passing score. He thought of instituting a minimum score that will motivate the students to study harder to get a score equal to or higher than said minimum score in his class and thus he reformulated his long examination to screening examination. The succeeding examination (the second long examination which was converted into a first screening examination) had a retention score of 20 points already but then many students have improved their performance in the examination getting a score equal to or greater than 20 points. The mid-term examination, considered a second screening examination with a retention score of 35, further motivated the other students to study and obtain scores higher than 35. The third screening examination had a retention score of 50 which is already equal to the passing score he prescribed. After the third screening examination, he saw that only the good performers were retained and so he went back to the usual long examinations until the last examination given.

In the implementation of the screening examinations, the researcher usually briefs his students on what a screening examination is and the prescribed retention scores, as follows:

1. First Screening Examination : Retention Score = 10% of total items
2. Second Screening Examination : Retention Score = 20% of total items
3. Third Screening Examination : Retention Score = 30% of total items
4. Fourth Screening Examination : Retention Score = 40% of total items
5. Fifth Screening (Mid-Term) Examination : Retention Score = 50% of total items

The passing score in these screening examinations is 50%. After the fifth screening examination, the researcher conducts long examinations again because by that time, after a series of five (5) screening examinations, the poor performers were already screened out.

The Passing Percentage in the Higher Engineering Mathematics Subjects

From School Year 2003 – 2004 to School Year 2006 – 2007, the researcher conducted the traditional long examination. Table 1 shows that the passing percentage of his students in the different higher engineering mathematics subjects when long examinations only were conducted ranged 6.25 to 33.33 % with an average of 24.05 %. The table likewise showed that the number of students with passing grade increased from mid-term to the final computation, but quite minimal.

Table 1
The Passing Percentage of Students in the Different Higher Engineering Mathematics Subjects when only Long Examinations were conducted

Subject	Semester	School Year	Number of Students with Passing		Total Number of Students	Passing Percentage
			Mid-Term Grade	Final Grade		
Differential Calculus	First	2003-2004	3	3	9	33.33
Differential Calculus	First	2005-2006	2	5	16	31.25
Integral Calculus	Summer	2006	2	3	48	6.25
Differential Calculus	First	2006-2007	9	9	50	18.00
Differential Equations	First	2006-2007	6	11	35	31.43
Average Passing Percentage						24.05

On the other hand, from School Year 2010 – 2011 to School Year 2012 – 2013, the researcher conducted his long examinations using the screening examination strategy. All students whose scores were below the retention score were screened out from his classes. Table 2 indicates that the passing percentages of his students in the different higher engineering mathematics subjects with the conduct of the screening examinations ranged from 41.2 % to 53.7 % with an average of 48.07 %. It could be gleaned in the table that with the screening examinations the number of students having passing final grade has almost doubled the number of students having mid-term grade.

Table 2
The Passing Percentage of Students in the Different Higher Engineering Mathematics Subjects when Screening Examinations were conducted

Subject	Semester	School Year	Number of Students with Passing		Total Number of Students	Passing Percentage
			Mid-Term Grade	Final Grade		
Integral Calculus	Second	2010-2011	9	14	34	41.20
Differential Equations	First	2011-2012	7	15	33	45.45
Integral Calculus	Second	2011-2012	9	21	42	50.00
Differential Equations	First	2012-2013	21	46	92	50.00
Integral Calculus	Second	2012-2013	12	22	41	53.70
Average Passing Percentage						48.07

Table 1 reveals that the average passing percentage in the higher engineering mathematics subjects when long examinations were conducted was only 24.05% while Table 2 reveals that the average passing percentage when screening examinations were conducted was 48.07%. This shows that the average passing percentage of students in higher engineering mathematics subjects increased when screening examinations were conducted. The researcher strongly believes that the screening examination stimulated the students to do whatever learning strategy they can just so to be able to escape from being screened out and, eventually, pass the subject.

The Students' Comments on the Conduct of Screening Examinations

A simple survey on the conduct of screening examinations was conducted among the researcher's students in the School Year 2010 – 2011 up to School Year 2012–2013. The researcher made a survey instrument which contained five (5) questions only, as follows:

1. Have you taken a Screening Examination conducted by Dr. Benjamin D. Varela?
 Yes No
2. If YES, in what subject/s?

3. Before the conduct of the Screening Examination, were you briefed about this?
 Yes No

4. What do you think is / are the advantage/s of having the Screening Examination to you?
5. What do you think is / are the disadvantage/s of the Screening Examination to you?

The survey results are tabulated in the succeeding tables as follows:

1. Table 3 indicated that majority of the student-respondents (59 %) claimed that the screening examination “forces them to study harder and pass the subject.” This was followed by 17 % of the respondents who believed that the screening examination “helps them to build up / level up their knowledge in mathematics”, and 11 % of the respondents claimed that screening examination “develops the seriousness to study.”

Table 3
The Advantages of Conducting Screening Examination According to the Student-Respondents

Advantages	Frequency	Percentage (%)
Forces myself to study harder and pass the subject.	53	59
Helps us to build up our knowledge in mathematics.	15	17
Develops in me the seriousness to study.	10	11
Makes us realize we are not meant for an engineering course so we should shift to another course.	6	7
Improves our study habits.	4	4

2. Table 4 listed the disadvantages of conducting screening examination according to the student respondents. Thirty (30) percent of the student-respondents claimed that the screening examination had “no disadvantage/s”. Thirteen (13) percent of the student-respondents, however, felt that the screening examination “did not give them the chance to improve their performance” while another ten (10) percent realized that the screening examination “lowered their self-confidence”.

Table 4
The Disadvantages of Conducting Screening Examination According to the Student-Respondents

Disadvantages	Frequency	Percentage (%)
None	27	30
It gives so much pressure to us to study and in taking the examination.	22	24
It lowers our self-confidence.	9	10
It makes us shy to continue attending the class.	5	6
It develops some kind of fear in the students.	5	6
We tend to focus our efforts in passing the screening examinations leaving behind our other subjects.	5	6
We are not given a chance to improve our performance.	12	13
We fail because we have insufficient knowledge on the prerequisite subjects.	5	5

The results of the survey clearly show that the conduct of the screening examination greatly benefitted the students because it did not only resulted in obtaining a passing grade in their subjects but imposed discipline upon them and their study habit. Thirty percent (30%) of the respondents revealed that screening examinations did not have any disadvantageous effect on them while fifty nine percent (59%) divulged that the screening examinations forced them to study harder in order to pass the subject. Actually, the students recommended that screening examinations should be conducted even in the lower engineering mathematics subjects (Algebra, Trigonometry and Analytic Geometry) as well as in the major subjects if only to encourage the students to study harder so that passing rates in these subjects will be increased as well and failures are minimized.

Reflection

The conduct of the screening examination implies students' need to be aware that they can be screened out from their class and so they should perform better. It also implies the need for new strategies, approaches and techniques in teaching mathematics. Finally, the conduct of screening examination implies that the performance of students through screening examinations will slowly but surely improve from obtaining a score just equal to or a bit higher than the retention score to obtaining a passing score.

On the other hand, the conduct of the screening examination has the following limitations:

- a. For a subject with prerequisite subject/s, the screening out of students in the first or second screening examination may be due to weak knowledge of the prerequisite subject/s and not of the subject the student is currently taking.
- b. Upon hearing the conduct of screening examination, some students developed fear towards it and lose their self-confidence, and, hence, are bound to fail as early as in the first screening examination.

References

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