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Mathematics learning through classroom assessment: Evaluating the value of weekly class tests

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Abstract

This study adopted a descriptive case study to explore the impact of weekly class test alongside two other modes of assessment strategies: use of project work and class presentation on learning outcomes in mathematics among 145 year-one high school students in the Central Region of Ghana. Subject evaluation questionnaire and scores obtained in weekly class test, end of term examination, class presentation and project work were the main sources of data collected for the study. The results indicated that scores obtained from all the modes of assessment (class test, class presentation and project work) used in the study correlated with end of term examination; however, the best predictor of end of term examination was class test. Thus, the study revealed that employing class test as an approach in the classroom drives students to deepen their understanding of concepts taught, encourage students to review their notes ahead of each new class session and consequently enhance their learning outcomes. Furthermore, the results demonstrated that students who were most committed in the subject, as evidenced by participation in all class tests, fared significantly better in the end of term examination than those who failed to participate in most of the class tests and those who participated mid-way. Consequently, the study reiterates that increased frequency of class test has the potential to impart student learning outcomes.

Keywords: assessing further mathematics; learning outcomes; predicting high school mathematics achievement

Introduction

Assessment has become a powerful lever that teachers have to use to influence the way students respond to subjects taught and behave (Gibbs, 1999). However, there seems to be a supposition that the benefits or otherwise of most conventional forms of assessment are already known as reported in some studies. For instance, Zeidner (1990) indicated in his study that assessment energizes shallow surface learning as students attempt to memorize their notes; suppresses student development since it suggests that there are 'right' answers that must be learnt; discourages student engagement in light of the fact that class tests tend to pressure exhausting 'realities' over intriguing 'thoughts and contentions' and likewise, decreases student enthusiasm since students find class tests upsetting and their outcomes excruciating. Haigh (2002) further reported that a number of dynamic teachers who have utilized class test for student assessment

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reiterated that it is a poor practice and report by Nuzum (1999) clearly indicated that students detest it.

Albeit, Shirvani (2009) observed that the frequency of assessment has an intervening impact on student engagement in learning. Research by Marcell (2008) demonstrated that when the frequency of testing is increased, there is increased student involvement in responding to questions and in discussing the subject matter. The assertion has been retorted by different researchers (Haigh, 2002; Leeming, 2002) that regular testing encourages students to monitor their learning and reinforces their engagement with the subject as a result of immediate feedback provided. It has likewise been established that frequent testing has positive impact on future retention of material learnt (Roediger & Karpicke, 2006). Since retention of material is one of an imperative segment of learning (Wolf, 2007), it can be inferred that regular testing adds to authority learning. While there might be some reality in these convictions, class test is a piece of the instructive toolbox and, similar to any such device, its impacts on student learning depend to a large extent, on how it is utilized. This paper gives an insight to the use of class tests and seeks to explore its impact on students' learning and their ability to self-construct their own understanding in the mathematics classroom.

It attempts to provide insights to questions such as "how do teachers bridge that tricky moment at the start of each class session, when the task is to pull together the strands of previous sessions and try to move forward?" How is it possible to guarantee that students are prepared and ready for the instructional period? How can this be done when the class includes students who are not fully committed to the subject? Ordinary good practice dictates that each new class should start with review of the past session's work (Haigh, 2002). However, the plain reality is, if a student was missing in class the previous session or has not tried to get ready ahead of the new class, this review may have no positive impact on student learning. The issue settles as how to urge students to enter each new class with the works from the previous session new in their brains. In this study, the approach adopted by the authors was to start each new class session, or affirm to start each new session with a short class test that covers the fundamental focus from the past session and sometimes in addition, the required reading for the present session. The aim was to investigate the extent to which the use of weekly class tests influenced learning outcomes of students at the end of the term when they took their final examinations.

Significance of class test

Gronlund and Linn (1990) noted that class tests are systematic procedures for measuring behavior or for determining how an individual acts when compared with others or when certain assignments need to be completed. Morrow, Mood, Disch and Kang (2005) stated that a class test is an instrument that is used to measure a specific skill. Such instruments can include written, oral, physiological, and/or mechanical devices. These opinions are supported by Hopkins (1986), who argue that a test is an instrument, tool or procedure that contains assignments that students should address and that provides results that can be used to measure certain aspects of students' knowledge. Cronbach (1994) and Nitko (2001) stated that a class test is a systematic procedure for monitoring and describing one or more student characteristics using a numerical scale or classification scheme and/or a numerical standard or category system. Anastasi and Urbina (1997) wrote that a class test is an instrument with objective standardization, and its results can be used broadly (for example, to compare psychological circumstances or individual behaviors). Regarding the function and purpose of class tests, Popham (1995) stated that they are useful for

diagnosing students' strengths and weaknesses, determining student development, deciding student rankings, and determining the efficacy of further learning. Furthermore, Hopkins (1986) indicated that class test is used in quantifying student learning outcomes and it may be the main reason a test may be conducted.

Although literature reviewed showed limited number of studies conducted in a variety of disciplines, what was intriguing is that all the studies reported a positive influence of the class testing concepts in a variety of classrooms, even though they were implemented in a variety of ways. Shepard (2000) found that assessing prior knowledge and experience not only improved her teaching of mathematics concepts, but also drew students into the habit of reflecting on their own knowledge.

In science education, Liggett-Fox (1997) found that class testing can assist students in laying aside their previous misconceptions about a topic. He reiterated that: "... too often, we don't investigate what misconceptions our students have. Even if we find out what beliefs our students have, we assume that giving them the "correct" information will make them abandon their misconceptions and adopt the new information. We need to understand that students form misconceptions based on their experiences. As a result, our students do not have any motivation to give up their closely held beliefs because their misconceptions seem to work ... (Page 29)" By having questions scored "incorrect' on a test, she found that her students were more interested in finding out why they missed the question, leading them to consider the possibility that their basic premises were incorrect.

In his study, Ochs (1998), found that the benefit of class testing in his upper level course was to have students realize what they did not know about fundamental chemistry, which in turn made them more receptive to continued chemical education. He reported that having given such tests for three years, he could report that the benefits exceeded expectations; not only did most of his students attend to fundamental chemical ideas, but also they developed a much more positive approach to the entire course. Furthermore, he indicated that in previous years, without the test, students were listless, and few took notes in the first day lecture, however, by contrast, after the test, the response to the first lecture was entirely different: the students were deadly silent, all took copious notes and they listened intently.

These arguments suggest that employing class test as an approach in the classroom can make students aware of what they don't know and provide an impetus to deepen their understanding of basic concepts being taught.

The study arrangement

The strategy detailed in this paper has been adopted in year-one elective mathematics classes over the period of the first term of the 2017/2018 academic year of a senior high school in which one of the authors worked as a math tutor. Elective mathematics is an elective subject taken by students offering general science, general arts, business, and technical programs at the school. The teaching of the subject involved 35 hours, 20 minutes active contact hours, developed across 3 hours, 20 minutes (5 periods) in 11 consecutive weeks. Table 1 gives the enrollment of students that took elective mathematics as one of their elective subjects.

Table 1 - Enrollment of students offering elective mathematics

Program	Class	Enrollment	
		Male	Female
General Science	1S	26	17
General Arts	1A1	18	15
Business	1B1	10	5
Technical	1T	52	2

Class tests were presented in the primary session as a school based subject assessment component. Students were informed that each class test would cover major areas from previous sessions or the required reading as indicated in the scheme of work. They were advised, at the start of the term, the rationale behind these weekly class tests; namely to make them review their notes ahead of class, undertake the required reading or potentially make up for lost time in the event that they missed a session. They were administered at the start of each lesson, at the whim of one of the authors. All together there were 11 class tests during the term under consideration and, in sum, the assessment added up to 15% of the marks for the school based subject assessment. The intention was to make the marks for the sum of the class test substantial, while keeping the assessment for individual class test small enough to be non-threatening (cf. Zeidner, 1990). This is quite different from what usually pertains in the conventional mathematics classroom where teaching was mainly teacher-centered (Agyei & Voogt, 2015; Agyei & Voogt, 2014; Agyei 2013) and class tests conducted in the entire term ranged from 2 to 3 and strictly used for assessment purposes.

Thus, the critical distinction between the application of the weekly class tests in this study and their traditional use lies in the motive for conducting the test. The weekly tests as applied in this study did not place much focus on assessment purposes; rather, it was aimed at ensuring class planning, promoting attendance and hopefully, ensuring that the students attending the class knew enough to participate in class discussion designed to reinforce learning. Notwithstanding, the strategy likewise added to the assessment generated further the question of whether or not the mode of assessment used supports other, more usual, methods of assessment. In this respect, the study apart from exploring the value of weekly class tests on students' learning outcomes also investigated other modes of classroom assessment methods including use of projects and group presentations.

Another concern the study sought to address was to ascertain the assertion reported by different researchers (Haigh, 2002; Leeming, 2002), that regular testing has the tendency to promote student learning and enhance their learning outcomes. Accordingly, the authors classified participants of the study into three groups depending on their levels of participation in the class tests: 1) Less than 50% participation in class test, 2) greater that 50% but less than 100% participation in class test; 3)100% participation in class test. The rationale behind the groupings was to help the authors ascertain the extent to which frequent testing impacted on retention of materials students learn and consequently their learning outcomes (which is operationalized as their examination score hereafter). The study was therefore guided by the following questions:

1. What is the relationship between class test scores and end of term examination scores?
2. Does end of term examination scores differ in terms of participation in the class test?

3. To what extent do other modes of assessment (i.e. class presentation, term's project work, class test) influence examination scores?

Methods

Research Design and Sample

A descriptive case study was adopted as the research design for the study. The researchers adopted case study method because it enabled the researchers to closely examine the data within a specific context. According to Grassel and Schirmer (2006), case studies, in their true essence, explore and investigate contemporary real-life phenomenon through detailed contextual analysis of a limited number of events or conditions, and their relationships.

A census study was employed since the entire population took part in the study. Since the population was small enough, data was collected from all members to create valid knowledge about participants as reported by Ogah (2013). The participants in the study were all the 145 year one students offering elective mathematics in the high school. The average age of the participants was 16 years. There were 106 males and 39 females.

Instruments

Class Test Instrument: In all, eleven class tests were developed and conducted throughout the study. The class test focused on previous session(s) content and reflected students' readiness for the next lessons. The class test consisted of 2 – 4 open-ended questions, each requiring few steps to answer within 10 – 15 minutes. Each class test was administered at the start of each instructional period. The class test scores were recorded and formed part of the school based assessment.

End of Term Examination: The end of term examination consisted of two papers. Paper 1 consisted of 40 multiple choice questions which were answered within a period of 1 hour and 30 minutes. After a break of 3 hours, paper 2 continued and consisted of 8 compulsory questions and 4 optional essay type questions to be answered within a period of 2 hours, 30 minutes.

Class Presentation: Class presentations were made during the instructional period. Though the presentations were done in groups of 5, each group member within a group had the opportunity to present aspects of the work. The presentation lasted for 20 minutes and the same marks were awarded for members in a group. The marks ranged from 5 to 10.

Project Work: The project given to the students was titled "Career Investigations Project". In this project, the tutor provided students with a list of math–based careers and a set of questions to guide students investigate into one of the specific careers they chose. A grading rubric was also provided to serve as a guide in the students' responses. The project was given to them at the start of the term and submitted at the end of the term.

Subject Evaluation Questionnaire: A subject evaluation questionnaire of an open format was administered to the students at the close of the term. The questionnaire was to be returned anonymously and aimed at determining whether the students found the class test a valuable part of the subject and whether preparing for the class test helped them learn more from preceding classes. The questionnaire data was meant to provide in-depth elaborations for the data collected through the test instruments.

Data Analysis

To analyze the data descriptive statistics, correlation analysis, analysis of variance and regression analysis were used. Effect size was calculated using Cohen's d (Cohen, 1988). Cohen (1988) provided tentative benchmarks for the interpretation of effect sizes. He considers d = 0.2 a small, d = 0.5 a medium and d = 0.8 a large effect size. Data collected from questionnaire was analyzed qualitatively using data reduction techniques in which major themes were identified and clustered (Miles & Huberman, 1994).

Results

The first research question sought to explore the relationship between class test scores and end of term examination scores using correlation. Correlation between the overall class test score and end of term examination scores was strong and highly significant ($r = 0.849, p = 0.000, p < 0.01, n = 145$). This suggests that the class test results broadly reinforce this more traditional form of assessment, which is also usually taken as a measure of student learning. In conventional terms, this suggests that the class test technique described in this study fosters student learning. Exploring the relationship between the participants' learning outcomes (examination score) and their class test scores (based on their levels of participation in the class tests) the results showed strong and highly significant ($r = 0.777, p = 0.000, p < 0.01, n = 69$) correlation for students who were fully committed to the subject (100% participation in class test). The correlations ($r = 0.452, p = 0.000, p < 0.01, n = 52$) and ($r = 0.471, p = 0.010, p < 0.05, n = 24$) were weak but significant for scores of students who were not fully committed (less than 50% of participation in class test) and students between the two extremes of participation (thus, greater than 50% but less than 100%) respectively. This results seem to suggest that students who were more committed to the lessons and had high participation levels in the weekly class test also performed well in the exams and vice-versa. Table 2 shows the correlations results between the class test scores and end of term examination.

Table 2 - Correlation Matrix between Class Test Scores and End of Term Examination

	End of Term Examination
$<$ 50% Participation in Class Test Score	0.452** ($p = 0.000,\ p < 0.01$)
$>$ 50% Participation in Class Test Score	0.471* ($p = 0.010,\ p < 0.05$)
100% Participation in Class Test Score	0.777** ($p = 0.000,\ p < 0.01$)
Overall Class Test Score	0.849^{**} ($p = 0.000, p < 0.01$)

** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

Further analysis was done to determine if end of term examination scores differed in terms of student's level of participation in class test. A one-way ANOVA was carried out and this helped in responding to the research question two. The independent variable represented the three different class test participation group: 1) Less than 50% participation in class test; 2) greater than 50% but less than 100% participation in class test; 3)100% participation in class test. The dependent variable was the students' end of term examination scores rated on scale of $0 - 50$. We present first the descriptive statistics of the scores as shown in Figure 1. The figure indicates how participation in the class test links to end of term examination score which is indication of a

standard measure of learning. The box plots show the median and interquartile ranges of marks for the three categories of students' participation. First, are those most committed to the subject; those who participated in all the class tests ($n = 69, mean = 29.70, SD = 9.44, CV = 31.78\%$); last, are those that this paper describes as not committed to the subject ($n = 52, mean = 6.39, SD = 4.15, CV = 64.95\%$), who contrived to either miss or fail to participate in more than half the class tests. Between is the plot of those who participated in at least half the class tests ($n = 24, mean = 15.27, SD = 8.14, CV = 51.85\%$).

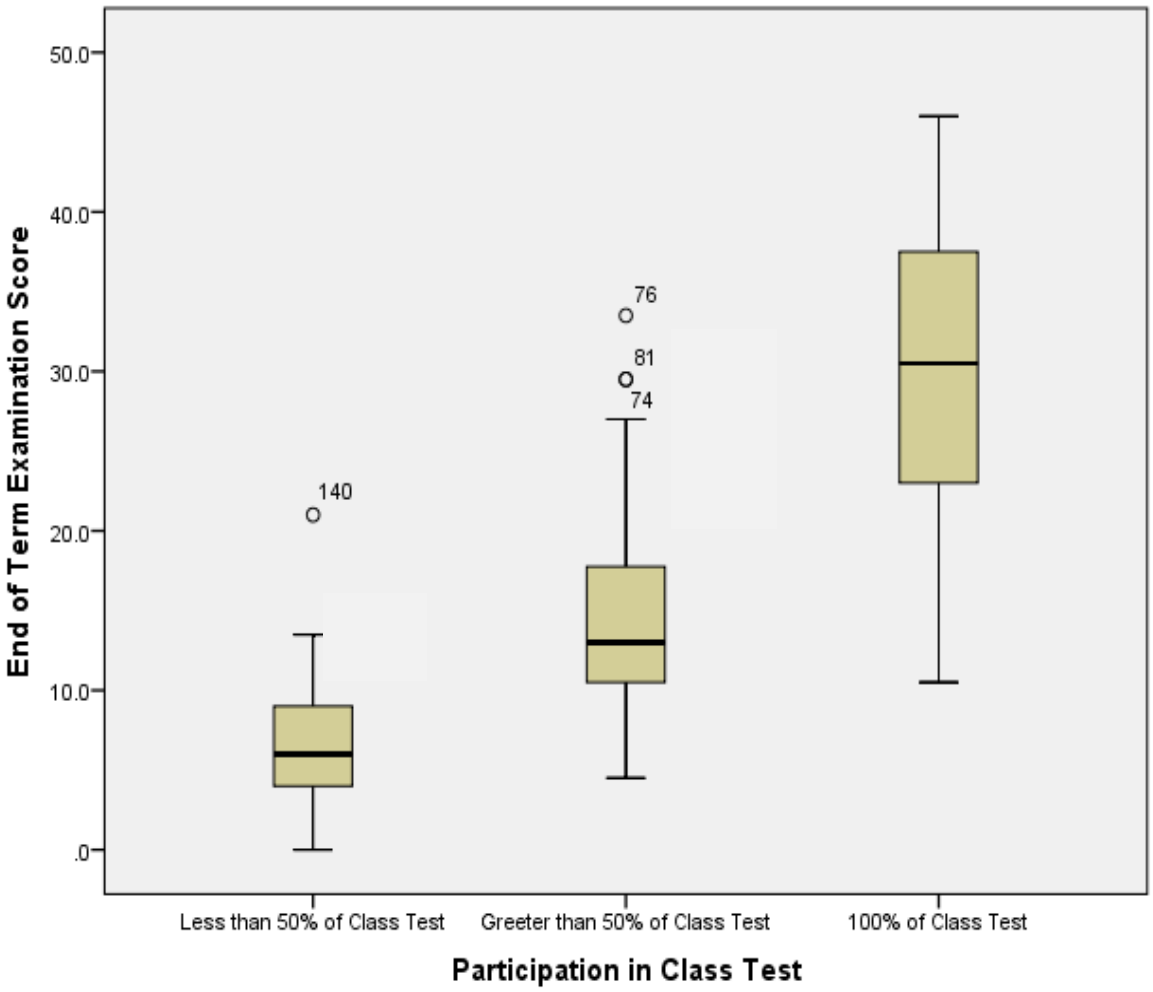

Figure 1: End of Term Examination Scores by Level of Participation in Class Test

These data were adjusted for students who were absent or by a medical note or similar justification did not take part in the class tests. The results seem to suggest that the means differ for the three categories of students but this is further confirmed by the ANOVA test. Table 3 shows the output of the ANOVA results. The ANOVA was significant $[F(2,142) = 138.66, p = 0.000]$ across the mean scores of the three categories of students participating at different levels in the class test.

Table 3 - ANOVA of end of term examination and student participation in class test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16513.205	2	8256.603	138.660	0.000
Within Groups	8455.457	142	59.545		
Total	24968.662	144			

**Correlation is significant at the 0.01 level (2-tailed).

To evaluate the extent to which differences existed between the three groups, Post hoc comparison using Tukey Cramer procedures was used to determine which pairs of the three class test participation group means differed. These results are shown in Table 4. Overall results indicated that there were appreciable difference between end of term examination score and class test score for all the three class test participation group. The largest difference was between students participating in all class tests (100% of class test) and students participating in less than 50% of class test with a mean difference of 23.18 and an effect size of 3.20, followed by the difference between students participating in all class tests (100% of class test) and students participating greater than 50% but less than 100% of the class test with a mean difference of 14.43 and an effect size of 1.64. The least difference was observed between students participating in greater than 50% but less than 100% and students participating in less than 50% with a mean difference 8.89 and an effect size of 1.37. The results seem to suggest that the effort students put in their learning process is evident in their end of term examination score.

Table 4 - Post Hoc results for end of term exams score by participation in class test group

(I) Participation in Class Test	(J) Participation in Class Test	Mean Difference (I-J)	Std. Error	Sig.	Effect Size
Greater than 50% of Class Test (but less than 100%)	Less than 50% of Class Test	8.8862*	1.9042	0.000	1.37
100% of Class Test	Less than 50% of Class Test	23.3183*	1.4171	0.000	3.20
100% of Class Test	Greater than 50% of Class Test (but less than 100%)	14.4321*	1.8287	0.000	1.64

*The mean difference is significant at the 0.05 level.

The study further sought to explore the extent to which other modes of assessment: use of class presentation and term's project work also influenced end of term examination score. The purpose was to establish which of the modes of assessment: use of class presentation, use of terms' project work or use of the weekly class test best predict learning outcomes of students in terms of their end of term examination scores. First a correlation analysis was conducted between the exams scores and scores of the three modes of assessment. Similar to results shown in Table 2, the end of term examination scores correlated significantly with all the three modes of assessment with the strongest ($r = 0.849, p < 0.01, n = 145$) being reported in the class test scores. The next reported was with class presentations ($r = 0.714, p < 0.01, n = 145$) and with term's project work ($r = 0.451, p < 0.01, n = 145$), a relatively weaker correlation was reported.

Table 5 shows the summary of results of the correlation between the scores of the modes of assessment and end of term examination score.

Table 5 – Correlation between modes of assessment and end of term exams ($\mathbf{N = 145}$)

		Term's Project work	Class Presentation	Class Test Score
End of Term Examination Score	Pearson Correlation	0.451**	0.714**	0.849**
	Sig.(2 tailed)	0.000	0.000	0.000

** Correlation is significant at the 0.01 level (2-tailed).

Second, a regression analysis was performed to explore the best predictor of end of term examination score. The results as presented in Table 6 show that, approximately 72.4% of the variation in a change in end of term examination score is explained by the variation in class test score, class presentation score and term's project work. The $F[(3,141) = 123.267, p < 0.01]$ associated with the independent variables was statistically significant indicating that class test score, class presentation score and term's project work predict end of term examination score. Table 6 shows the summary of the regression analysis of other modes of assessment and end of term examination. According to the standardized coefficients, the regression model is given as:

$$Exams\ Score = 0.017\ Term's\ Project\ Score + 0.064\ Class\ Presentation\ Score + 0.828\ Class\ Test\ Score$$

The result indicates that class test score seems to be the strongest predictor of end of term examination outcome compared to term's project work and class presentation. Thus, even though term's project work, class presentation and class test are all predictors of outcomes in end of term examination, the results of the current study show that the impact of class test is more conspicuous with end of term examination. This is an indication that use of class test as a mode of assessment played a very significant role in helping the students learn their mathematics concepts and consequently impacting their learning outcomes.

Table 6 - Regression analysis of modes of assessment and the end of term examination

	Coefficients			F-Test	
	Unstandardized Coefficients	Standardized	Sig	F	Sig
Intercept	2.230			123.267	0.000
Project Work Scores	0.015	0.017	0.018		
Class Presentation Score	0.061	0.064	0.027		
Class Test Score	0.930	0.828	0.000		

Multiple $R = 0.851, R^2 = 0.724, Adjusted\ R^2 = 0.718,$ *Significant at* $P < 0.05$

Participants' responses from the open ended questionnaire reiterated the findings much better. Themes generated bothered on both positive and negative views on the use of the weekly class test they participated in. The results and some specific student comments are included in Table 7. Some 97 students agreed that the class test met the subjects' aims of encouraging revision before each class session and 82 students added that they attended class regularly because of the class test. However, 23 students commented that the class test were too many and 18 students arguing that each class test carried too few marks to make the effort worthwhile.

Table 7 - Students' views on class test (N=145)

Comment	Frequency
Positive Comments:	
Made me to revise before each class session	97
Made me to attend class regularly	82
Negative Comments:	
Class tests were too many	23
Too few marks per class test to be bothered	18

Special Comments:

- *"It is very essential to review notes before each class… this is one of the only a few subjects where I feel last minute cramming for the examination will not be necessary"*
- *Class tests were a good 'learning' technique …making the learning process easier"*
- *"Class test every week... an excellent way of getting people to attend class… I really learnt from the class tests"*
- *"The class test kept us on our toes…"*
- *"I will prefer more marks of a longer test more than several small tests which are not worth much".*

Discussion

The results of the study showed that the overall class test score significantly correlated with end of term examination. This seems to mean that class test enhances student learning and improves their understanding of mathematical concept taught. The results are consistent with Shepard (2000) who found that assessing prior knowledge and experience not only improved teaching,

but also draws students into the habit of reflecting on their own knowledge. Similarly, the result is consistent with that of Marco and Crone (1991) who found class test as a mechanism that fosters student learning.

This conclusion is strengthened by the comparison of performance between students who participated in all or most of the class tests as against those who participated in less than 50% of the class test. The results demonstrate that those who were most committed in the subject, as evidenced by participation in all class tests, fared significantly better in the end of term examination than those who failed to participate in most of the class test and those who participated mid-way. Obviously, there is some circularity in this argument. It could be contended that those who attend class would do better in end of term examinations and class test than those who do not. Most of the students felt that the class tests encouraged their class attendance. This results support that of Williams (1992) which showed that students prefer teachers who make their class compulsory and feel that they gain more when governed by this discipline (Williams, 1992). The analyses also showed that end of term examination correlated significantly and strongly with class presentation scores. However, the relationship between end of term examination score and term's project work was relatively weak but statistically significant. This might have resulted from the fact that term's project work as an assessment mode tests deep rather than shallow learning. The strong correlation between class presentation and end of term examination scores implies that class presentation also supports learning in similar ways as the class test but possibly at different levels as was shown in the regression analysis.

The analysis showed that the modes of assessment including class presentation use and term's project work influenced end of term examination outcomes. However, the best predictor of end of term examination was class test. This supports the argument that use of regular class tests enhances student learning and performance at the end of a course. The result is supported by previous studies that a substantial proportion of the variation in end of term examination score is due to regular class tests (Hopkins, 1986; Popham, 1995; Liggett-Fox, 1997; Ochs, 1998; Haigh, 2002).

Without doubt, one of the reasons this technique of class test succeeded was that, the class test questions were pitched at an accessible level. The class tests worked as a motivation to class participation and attendance. Ehrlich (1995) portrays how, in an early experiment, he sets questions that were too challenging and served only to remind students of their own inability to master the material. As a consequence, his students were unhappy and dreaded the tests. By contrast, when Ehrlich sets tests that were more easily answered, the positive results improved students' morale, self-belief, and determination to work hard to maintain good scores, which is consistent with the current study. Marco and Crone (1991) also found that their ability to predict college grades, (i.e. further learning, from High School SAT tests) was greatest when the challenge was linked to 'middle difficulty' for the average student.

Another reason that explains this success has got to do with the fact that the class tests were conducted on regular basis. Zeidner (1994) found that surprise tests were opposed by most of the students in his study; who felt that the test were administered for vindictive purposes and caused unnecessary stress. Zeidner's respondents were also worried that their tests tested relatively unimportant information. In contrast to Zeidner's study, the current study used class test to tackle major previous concept and were administered regularly with as little or no surprise as possible.

Researchers have much of the time demonstrated that assessment style drives students' strategies for learning (Hargreaves, 1996). Ramsden (1992, p. 211) advises that objective tests should be used with caution. A few modes of assessment have negative effects - empowering the surface learning more than a profound approach; Class tests are frequently numbered in such records (Kember, Jamieson, Pomfret & Wong. 1995). Unavoidably, the class test framework used in the study underscores learnt information. By urging students to review their notes from previous sessions, it encourages them to acquire from the present session and was emphasized by students in their response that, the approach helped them to be on top of their learning tasks (see Table 5).

The necessity for class attendance, however, makes the class test technique less popular with students that do not like to attend class so regularly and hence, are penalized by missing class test scores. Elsewhere, high levels of attendance in class and longer, more diligent, learning have been associated with students adopting inefficient surface learning strategies (Kember et al., 1995). However, in a subject that builds progressively away from the textbook and into uncharted territory as in the case of Elective Mathematics, there is no way to avoid class attendance. It is also undoubtedly the case that class test assesses surface learning. Albeit, it is very useful to have a reservoir of memorized learning in place at the start of each class session. This gives the teacher some foundations to build on during the session and hopefully, something to convert into deeper, longer term understanding. In this study, the class tests were welcomed because they contributed to the variety of activities undertaken in class and also provided opportunities for discussion with peers during preparation and post-mortem.

Conclusion

The introduction of regular class tests, that test students' knowledge and understanding of the content of previous session(s) and required some reading, has successfully encouraged students to review their notes ahead of each new class session. It seems to have encouraged greater class participation and attendance by a larger group of better-prepared students. Although the scores from class test used in the study correlated significantly with those of the other school based subject components that test deep learning, the results showed that class tests are the best predictor of examination scores and also support a reproducing orientation in student learning processes. This supports the view that, the students' preparation for a class test gives them additional short-term knowledge that helps the development of deeper learning in their new class sessions.

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