

Using Class Quizzes for Weekly Review



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Abstract

This article describes the use of classroom quizzes as a way of promoting student learning in the Department of Geography at Oxford Brookes University. Starting each class with a quiz on the previous session's work encourages students to review their course notes ahead of each session, removes the need for any spoken review of course progress, and abets attempts to help students convert surface memorisation into deep learning through classroom discussion. Class quizzes are popular with most students, who mainly agree with the above analysis. Quiz scores correlate significantly with most other types of assessment, including those from formal essay examinations, so they may be considered valid as a mode of assessment. The exercise described in this paper will have transferability to other degree programmes, including earth and environmental sciences.

Introduction

"Assessment is the most powerful lever that teachers have to influence the way students respond to courses and behave as learners" (Gibbs, 1999, p. 41). However, there remains an assumption that the merits or otherwise of most traditional forms of assessment are already well known. For example, every progressive instructor knows that using class quizzes for student assessment is poor practice. It encourages shallow surface learning as students try to memorise their course notes. It suppresses student innovation because it implies that there are 'correct' answers that must be learnt. It discourages student engagement because quizzes tend to stress boring 'facts' over interesting 'ideas and arguments'. It also reduces student enthusiasm because students find class quizzes stressful and their results painful (cf. Zeidner, 1990). Put simply, students do not like class quizzes (Nuzum, 1999).

While there may be some truth in these beliefs, the class quiz is a part of the educational tool kit and, like any such device, its impact on student learning depends, in large measure, on how it is used. This paper describes an application of class quizzes that aims to have positive impacts on student learning, student engagement, student enthusiasm, and students' ability to self-construct their own understanding.

First the problem: how do we as practitioners 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? The awkwardness recurs every week, especially in courses that are not discrete topical packages but have a direction and build towards a final goal. How is it possible to ensure that the students are ready and able to proceed? How can this be done when the class includes a population of 'semi-detached' students, those who are not committed to the course or who like to believe they can do enough to pass without much classroom endeavour or attendance? Their assumption may be right or wrong but, in the meantime, these students choke the development of the course through their inability to contribute to classroom discussion or interaction. Normal good practice dictates that each new class should begin with a review of the previous session's work. However, the plain fact is, if a student was absent in either body or spirit during that previous session or has not bothered to prepare ahead the new class, this review may have little positive benefit. The problem resolves as how to encourage students to enter each new class with the works from the previous session fresh in their minds?

The solution, proposed to the author by colleague Peter Keene, is to begin each new session, or allege to begin each new class session, with a short class quiz that covers the main points from the previous session and perhaps also the required reading for the current session. The question discussed here is does this work? Specifically, are class quizzes a useful form of assessment that broadly support other assessment strategies? In addition, do the students feel that class quizzes are a useful course component that helps them learn?

Context

The strategy reported in this paper has been adopted in two advanced level modules in the modular course at Oxford Brookes University over a period of three academic years. Here, each module involves 32 classroom contact hours, developed across 4-hour blocks in 8 consecutive weeks. These two modules fill a variety of functions in an array of degree programmes. Typically, student participants take the modules as components of curricula that variously combine Geography, Physical Geography, Environmental Sciences, Water Resources, Environmental Biology, Planning Studies etc. These students are commonly in either their second or third year of undergraduate study. The two modules examined in this study are *MO2676: Gaia: the Earth as a Living System* (Haigh, 2001) and *MO2643: Soil Conservation*. This second supplements classroom contact with a laboratory / field programme of about 8 hours (cf. Haigh and Kilmartin, 1987). Typically, the modules enrol 20 - 45 students each year.

Class Quizzes

The class quizzes are introduced in the first session as a coursework component called "Echoes". Students are informed that each Echo quiz will cover major points from previous sessions or the required reading. They are advised, at the outset, of the purpose of these quizzes - namely to make them review their notes ahead of class, undertake the required reading and/or catch up if they missed a session. Each quiz consists of 2-4 open-ended questions, each requiring a sentence or so in answer. They are administered at the start of each session or immediately after a coffee break, at the whim of the instructor. There are 4-6 quizzes during the module and, in sum, the assessment adds up to 20% of the marks for the module. The intention is to make the mark for the sum of the quizzes substantial, whilst keeping the assessment for individual quizzes small enough to be non-threatening (cf. Zeidner, 1990).

The significant difference between this application of class quizzes and their traditional use is that the main function is not assessment. Instead, it is to encourage class preparation, attendance and, hopefully, ensure that the students attending know enough to participate in class discussion designed to reinforce learning. However, the technique also contributes to assessment and this generates the question of whether or not the assessment generated supports other, more usual, modes of assessment. So the questions are, did the strategy work, and is the assessment generated useful?

Evaluation

Three approaches have been adopted for the evaluation of the role of class quizzes in the two modules. The first involves the statistical comparison of Echo quiz scores with other aspects of assessment using Spearman correlation on mark-sheets for 227 students (cf. Haynes, 1996). The initial assumption might be that class quiz scores would not correlate with aspects of assessment that test deeper learning, such as an essay-based examination, a learning journal, a self-constructed laboratory exercise, and a field interpretation exercise. They might, however, correlate with scores collected by students who performed well in making a short classroom representation of a textbook reading, since this could be constructed on memorisation and other reproducing-orientation skills.

The second involves a comparison of the performance of students who completed all the class quizzes with those who completed 50% or less (already labelled in this paper as the 'semi-detached').

P L A N E T

The third involves the analysis of 127 course evaluation questionnaires for the two courses, collected in the period May 1999 - July 2001. These questionnaire returns are anonymous, so it is not possible to differentiate between responses on the basis of student attendance or performance. Instead, the aim is to determine whether the students found the class quizzes a valuable part of the programme and whether preparing for the quizzes helped them learn more from succeeding classes.

Evaluation was conducted by means of an open format questionnaire administered at the close of each course. Students were given report forms and asked to respond to the request 'Please describe, as fully as possible, your experience of this module?' This approach allows students to mention their concerns, both positive and negative without any constraints concerning either topic or topic selection. The assumption is that if a student finds something valuable about the course, they will mention this fact. Equally, if they have negative feelings or problems about an aspect of the course, this will also be mentioned. As an approach to evaluation, this seems hugely preferable to any method that constrains student views by closed questions and some kind of liker t response scale. It also supports the learning strategy of the Oxford Brookes University Geography Department, which emphasises student-centred and student-active learning, and where - by listening to what the students actually want to say - the courses aim to help the student get the most from their own education.

In one case, evaluation policy deviated from this completely open structure. In 2001, students on *MO2643: Soil Conservation* were asked a second question specific to the class quiz component of the course. This asked if they felt that the class quizzes encouraged them to review their notes ahead of each lecture and whether they regarded the class quiz as an adequate replacement for any spoken review of the previous week's work.

Results

Correlations between the class quiz and final examination scores were reasonably strong and highly significant ($\rho=0.384, p<0.0005, n=227$). This suggests that the class quiz results broadly reinforce this more traditional form of assessment, which is also usually taken as the measure of student learning. In terms conventional, this suggests that the class quiz mechanism fosters student learning (cf. Marco and Crone 1991).

The Echo quiz scores also correlate significantly with three other modes of assessment. As expected, they correlated strongly with spoken class presentations ($\rho=0.284, p<0.0005, n=153$), where memorisation may play a major role. They make weaker correlations with a learning diary exercise in the Gaia course ($\rho=0.255, p<0.046, n=61$, see: Haigh, 2001) and a team self-constructed laboratory experiment in the Soil Conservation course ($\rho=0.210, p<0.026, n=112$, see: Haigh & Kilmar tin, 1987). These are exercises that require deep introspection and a creative understanding of theory, respectively. The quiz scores did not correlate with results from the Soil Conservation course's field trail, which involved the application of book-learning to the diagnosis of practical problems. In sum, however, while quiz scores correlate significantly with other aspects of assessment that emphasise the reproduction of learnt material, they also correlate significantly with some aspects of the courses that encourage independent and extrapolative thinking.

Figure 1 indicates how participation in the class quiz programme links to score in the final examination - used here as a standard measure of learning. These box plots show the median and, interquar tile ranges of marks for three categories of students. First are those most committed to the course; those who attended all the quizzes (100%) and scored more than zero marks in each quiz. Last are those, that this paper names "semi-detached", who contrived to either miss or fail to score points on more than half the quizzes. Between are those who scored points on at least half the quizzes. These data are adjusted for students who covered either absence or poor performance by a medical certificate or similar justification.

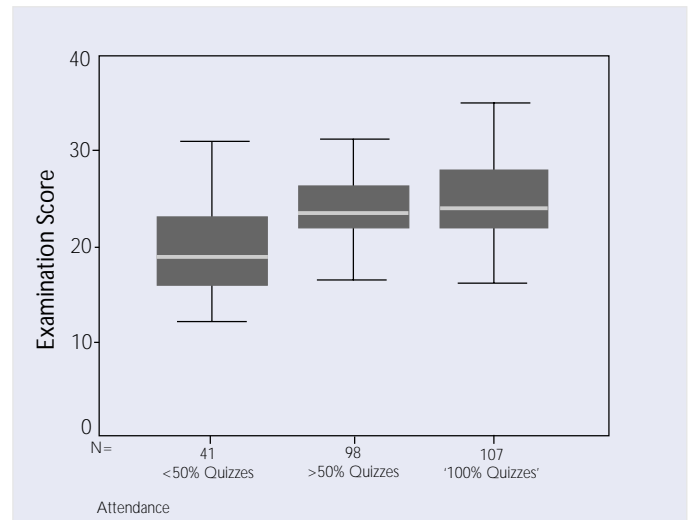


Figure 1. Quiz attendance and examination results

These data sets are large enough to be examined by an independent sample T-test, without concern for data normality (cf. Haynes, 1996). Table 1 identifies the results. Broadly, these confirm that those who scored in all or most of the class quiz events learnt more and performed significantly better in the final examination for the course. They also show that those who attended or scored points in less than half the class quiz events performed significantly worse in the final examination than those who scored points in half or more of the class quizzes.

T-test Results (<i>p</i> =represents the probability that the two samples could be drawn from the sample population)	Mean Exam Score (xx/40)	Sample size (n)	vs. Students scoring in all class quizzes	vs. Students attending or scoring in more than 50% of class quizzes	vs. Students attending or scoring in less than 50% of class quizzes
Students scoring in all class quizzes	24.4 +/-6.6	124	X	$p=0.046$	$p<0.0005$
Students attending or scoring in more than 50% of class quizzes	22.2 +/-7.4	114	$p=0.046$	X	$p=0.030$
Students attending or scoring in less than 50% of class quizzes	17.2 +/-9.6	52	$p<0.0005$	$p=0.030$	X

Table 1. Results of independent samples T-tests between examination scores of students attending different numbers of class quizzes. (NB there is a less than a 1 in 20 chance that any of the differences between three sample populations could be due to chance alone, $p<0.05$ in all cases).

The open-format questionnaires elicit two broad types of response. First, they elicit general impressions such as 'interesting', 'good', 'bad' or 'ugly'. These tend to dominate the first/last sentences in each student return. Second, they conjure up specific comments, positive and negative, about the special elements of the course that caught the student's attention. These comments make up the body of the return. Course components that receive comment may do so because they are regarded as a novelty (e.g. field trail), because they are helpful, or because they caused the students some kind of problem. If a course-attribute or component receives no mention under such situations, this means simply that the student did not feel it necessary to single the attribute out for comment, either positive or negative.

P L A N E T

The two courses under examination here have been run and evaluated for many years. In a new course, many rough edges show through, but in these courses several years of work and reworking have been devoted to help the module run smoothly. For example, in modules that recruit from geography and the social sciences, there is an immediate crisis every time a mathematical argument is presented. Crossing such hurdles, helping students to read and use each equation and to think about its meaning, has taken a lot of thought and time. A measure of success is that, now, few students list 'equations' among the negative or troublesome aspects of the course. In the same process of revision, generally popular course elements, such as the use of video case studies - supported by question sheets and student group discussion - can be tuned up. After some trial and error, other things being equal, the result can be a generally happy class.

Course Attributes in Rank Order	Respondents (n=67)
Enjoyable/Interesting etc. - positive general comments on the topics covered by the course	43
Good course / structure - positive general comments on the student on the structures and presentation of the course	37
Videos (and question sheets) - first ranked course component singled out for positive comment - students liked the videos and also the supporting question sheets, which try to ensure that they collect information and also apply critical analysis to the video text.	19
Quiz - second ranked course component	14
Choice in coursework - support for the selection of coursework activities available - often linked to comments about the development of personal skills	13
Student presentations -support for the opportunity for students to develop spoken presentation skills and gain assessment for not-written coursework. This is also the second ranked most disliked course component - a comment on the quality of some student presentations.	13
Handouts - students liked being given copies of the information on the OHP slides, which meant they did not have to worry so much about note taking and keeping up.	10
Dislike: 4-hour class block. Students argue that these are much too long and too intensive. (Almost every aspect of the course was disliked by at least one student - but the only component mentioned regularly was the 4-hour -block that was used by the session).	10
Field trail - supported by the students and mentioned, mainly, in connection with the thought that it should be compulsory and that it should be conducted in parallel with the virtual field trail of the same sites.	8
Lectures - general positive comments, not usually linked to any special attribute of the lectures.	6
Assessment balance - positive comments often linked to the 60:40% coursework: examination split and the assessment awarded to individual options - a position achieved for this course after years of trial and error.	6

Table 2. Digest of Evaluation Returns for M02643: Soil Conservation (1999-2001).

In 1999, 2000 and 2001, 67 of 89 students returned questionnaires on M02643: *Soil Conservation*. Overall, quizzes were the 2nd most frequently mentioned course component in the lists of positive course attributes; only the video case studies were more popular. They were listed as positive features of the course by 14 students and in a negative context by only one, which means that 52 students did not feel it necessary to single them out for specific comment. Table 2 provides a summary of the content of three years' anonymous course evaluation returns for M02643: *Soil Conservation*. It shows all comments that concerned 6 or more respondents and illustrates the typical mix of general and specific comments. In 2000-2001, 66 of 73 students on M02676: *Gaia :The Earth as a Living System*, completed course consultation questionnaires. Quizzes ranked 4th and 8th among lists of positive course attributes with a total of 11 respondents agreeing that the quizzes encouraged them to revise their notes. Quizzes were listed as negative attributes, ranking 5th and 9th, by 5 students who complained that quizzes were not specific enough to the previous week's work and carried too many marks.

Evaluation summaries are filed on the module website for student access and they are discussed at staff-student meetings.

In 2001, 27 students on M02643, the Soil Conservation module responded to a second question that asked students specifically for their views on quizzes. The results and some specific student comments are included as Table 3. Some 20 agreed that the quizzes met the course aims of encouraging revision, 12 added that they also replaced the need to review the previous lecture. However, 6 commented that the quizzes did not encourage the revision of course notes, 4 finding it possible to rely on memory, 2 arguing that each quiz carried too few marks to make the effort worthwhile.

Analysis of Student Comments (with number of respondents addressing topic)
<p>Positive Comments:</p> <ul style="list-style-type: none"> • Made me revise before each session: 12 • Effective - met both aims well: 12 • Good/ effective / (retain in module): 4 • Makes you want to go to class (assessment driven): 2
<p>Negative Comments:</p> <ul style="list-style-type: none"> • Did not achieve objectives: 6 • Too few marks per test to be bothered: 2
<p>Specific Illustrative Comments:</p> <ul style="list-style-type: none"> • "It became essential to review notes... this is one of only a few modules where I feel last minute cramming for the examination will not be necessary" • "Quizzes were a good 'learning' technique ...making the learning process easier" • "Quizzes every week - excellent way of getting people to lectures - I really learnt from the quizzes" • "Echo quizzes kept us on our toes..." • "They make us look at our work every week, however, if people wanted to learn, they would by themselves" • "Tests work very well, if people didn't listen the first time, they won't listen to a spoken review!" • "The tests don't encourage revision - but people check to see if they had the right answer afterwards". • "I'd prefer more marks of a longer test more than several small tests which are not worth much"

Table 3: Do class quizzes encourage the review of course notes and replace the need for a spoken review of the previous week's work?

Discussion

Researchers have frequently shown that assessment style drives students' strategies for learning (Hargreaves, 1996). Ramsden (1992, p.211) advises that objective tests should be used with caution. Some strategies have negative impacts, encouraging surface learning more than a deep approach. Class tests are frequently numbered in such lists (Kember et al., 1995). Inevitably, the class quiz system emphasises reproducing learnt information. However, it ranks among the most popular elements of coursework because it fosters deeper learning. By encouraging students to review their notes from previous sessions, it helps them gain more from the current session - the majority of those questioned directly emphasised that the approach helped them keep on top of their learning tasks (Table 3).

Statistical analysis shows that quiz results correlate strongly and significantly with other more usual modes of assessment, including those taken as indicative of deep rather than shallow learning. For example, formal examinations are regarded as the principal guide to student learning by the majority of courses in the majority of UK universities. The strong correlation between quiz and examination scores implies that quizzes support learning in similar ways.

This conclusion is reinforced by the comparison of performance between students that scored in all or most quizzes versus those who scored in less than 50% - here labelled 'the semi-detached'. The results show that those who were most engaged in the course, as evidenced by scoring in most class quizzes, fared significantly better in the final examination than those who failed to score in most quizzes. It must be emphasised that the phrase 'failed to score' broadly implies a failure to attend either the current session or to make up work from a missed previous session. Of course, there is some circularity in this argument. It could be argued that those who attend lectures would do better in examinations, class quiz or not. It has been shown that students prefer lecturers that make their lectures compulsory and feel that they gain more when governed by this discipline (Williams, 1992). Several students felt that the quizzes encouraged their class attendance.

Undoubtedly, one of the reasons the technique succeeds is that quiz questions are pitched at an accessible level. The tests work as an incentive to class participation. Ehrlich (1995, p.379) describes how, in early experiments, he set questions that were too challenging and served only to remind students of their own inability to master the material. As a consequence, students were unhappy and dreaded the quizzes. By contrast, when Ehrlich set quizzes that were more easily answered, the positive results improved student morale, self-belief, and determination to work hard to maintain good scores. Marco and Crone (1991, p.168) 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 ingredient of success seems to be that the tests were regular. Zeidner (1994) found that surprise quizzes were opposed by most of the students in his study; who felt that the quizzes were administered for vindictive purposes and caused unnecessary stress. Zeidner's respondents also worried that their quizzes tested relatively unimportant information. In sum, class quizzes have to tackle major issues and they have to be administered regularly with as little surprise as possible.

Zeidner (1994) reports that students who valued the tests did so for similar reasons to those voiced here. The quizzes provided a guide to progress (52%), motivation for the revision and review of course material (37%) and boosted grades (4%). Equally, most (70%) of Zeidner's sample of teachers welcomed quizzes because they kept students motivated (64%), provided prompt feedback on learning (25%) and provided a realistic appraisal of student knowledge (9%). Those who opposed quizzes thought they were stressful to students (52%), reduced student grades

(33%) and reflected only short term learning (7%). However, it has been suggested that learning is a function of the degree to which students feel concerned about the tasks they are set (Saljo and Wyndham, 1990). 'Concern' and 'stress' may be two sides of the same coin.

In response to these last points, quizzes that reduce student grades may be pitched at a level that is too hard to be useful. A successful quiz strategy, that encourages student learning, should generate high marks. These function to foster positive participation, to reward and reinforce those who are striving to keep ahead of the work - carrots rather than sticks to use a vernacular expression. Here, each quiz provides only the tiniest assessment incentive to class attendance. However, even such a small reward may be critical.

The necessity for class attendance, however, makes the technique less popular with students that do not like to attend class so regularly and hence are penalised by missing quiz scores. Elsewhere, high levels of attendance in class and longer, more diligent, studying have been associated with students adopting inefficient surface learning strategies (Kember et al., 1995). However, in a course that builds progressively away from the textbook and into uncharted territory as in the case of M02676: Gaia, there is no way to avoid class attendance. Even in M02643 Soil Conservation, the course deals with a subject that is in the throes of tumultuous and revolutionary change, which is being driven by field practitioners rather than academics and by workers whose studies and arguments are hard to access through library publications. The easiest route to deep understanding is through the critical evaluation of grey literature and video case studies, reinforced by classroom discussion between students.

Quizzes have the advantage that they remove some debate over marks and also the possibility of bluffing (cf. Zeidner, 1994, p.47). Zeidner suggests that students view essay-type exams as more fair than objective tests but this does not seem to be supported in this case (Zeidner, 1990 p.161). Zeidner (1990 p.158) adds that students find quizzes less stressful than essay tests.

Finally, it is undoubtedly the case that quizzes test surface learning. However, it is very useful to have a reservoir of memorised learning in place at the start of a class session. This gives the instructor some foundations to build on during the session and hopefully, something to convert into deeper, longer term, understanding. Here, the quizzes were welcomed because they contributed to the variety of activities undertaken in class and because, in preparation and post-mortem, they provided opportunities for discussion with colleagues.

Conclusion

The introduction of regular class quizzes, that test students' knowledge of the substance of previous sessions and required reading, has successfully encouraged students to review their course notes ahead of each class. The approach has been popular with a majority of students on the two courses where it has been introduced. In both cases, it seems to have encouraged greater class participation by a larger group of better-prepared students. Although class quizzes sponsor a reproducing orientation in student learning, the scores from these quizzes correlate significantly with those of course components that foster deep learning. These include traditional essay examinations, preparation of a learning diary and self-constructed laboratory experimentation. This supports the intuition that the students' preparation for a class quiz gives them additional short-term knowledge that abets the development of deeper learning by further study.

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Examining Home Learning Environments



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Abstract

This study uses a methodology originally developed by education researchers examining the homework environment and homework achievement of school pupils. We adapt the approach to make it relevant to higher education, in this case to Geography and Earth Science students. We find that environmental and personal components, significantly influence levels of student achievement. The rationale for this research is that as our demands for personal study increase (due to the rise in distance learning and WWW- based learning) we should develop strategies to improve the relationships between out-of-class learning environments and individual learning styles.

Introduction

A growing literature exists on the relationships between the learning environment and the achievement of learning outcomes (Fraser 1998). However, research into the influence of the learning environment on learning strategies is relatively new (Wierstra *et al* 1999). The overall aim of this kind of investigation is to identify the relationship between all aspects of the environment and the student, with the intention of improving the learning process. To date, much of the work in this area has been conducted on the in-class environments of school-age communities. Higher Education is differentiated from primary and secondary levels by its greater emphasis on personal study - termed 'homework' at these lower levels. Geography and Earth Science approaches are typical. It is essential that students follow up contact hours with reading, prepare for assignments and research dissertations, whilst managing their own study environments. Thus there is strong justification for examination of the influence of out-of-class learning environments as we move into a time where wider participation via e-based tuition and distance learning is promoted. Hong (2001) states that efforts have been made to adjust classroom environment to students' in-school learning styles and cites Boulmetis and Sabula (1996) and Caudill (1998) amongst others. Similar attempts should be made to encourage students to improve the environments in which they study in their own time.

Many of the factors which affect in-class learning environments can be controlled by the tutor and, to some extent, by the learners themselves. These include physical 'tangible' factors such as seating, temperature, lighting, visual aids and the existence of adequate work surfaces and also 'non-tangibles' academic context, motivation, peer influence and discipline. On the other hand many other factors will influence the effectiveness of personal study; these can be grouped as:

1. the cognitive and personality characteristics of the student (e.g. individual preferences of time, place and conditions);
2. the type of work being done (e.g. assessed, note-taking, research);
3. other influences on the process of learning outside the University environment (e.g. the impact of culture and subculture, paid work, social commitments, friends, family and flat-mates).

This preliminary study investigates the importance of aspects of the home learning environment on achievement. We base this work on the premise that HE has much to learn from the pedagogic research undertaken on school communities. This project relied heavily on a methodology developed by Hong and Milgram (2000) to evaluate the homework style of school (seventh grade) students in the USA. A homework scale was modified to be appropriate to an HE population. This involved for example omitting 'parents' as an influence on the home learning environment (although increasingly in HE the wisdom of this omission could be challenged).

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