Experiences of using student workbooks for formative and summative assessment

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Abstract In response to poor student attainment rates, the teaching, learning and assessment strategy of a Level 1 circuit theory unit has been revised to emphasise the importance of regular attendance at teaching sessions, and also to provide regular formative feedback. As part of the assessment scheme a tutorial workbook has been used for both formative and summative assessment. The workbook is assessed regularly during scheduled teaching sessions. The use of objective questions has reduced the time taken to assess the work, while the regular assessments help with student motivation, provide formative feedback, and help students to structure and pace their learning.

Keywords circuit theory; formative assessment; objective tests; student motivation and attainment rates

Southampton Institute offers a range of courses at undergraduate and Higher National level that include the study of electrical and electronic engineering. Many of these programmes are offered in full-time and part-time study modes. Consequently students have a wide range of prior skills, experiences and learning styles. Students enrolling on the various programmes also have a wide range of educational qualifications, including 'A'-levels, BTEC National Diplomas/Certificates and various international qualifications. Students also join their course after completing a Foundation or Access programme, either at Southampton Institute or elsewhere.

Teaching staff have therefore sought to develop appropriate teaching, learning and assessment strategies, while making efficient use of resources, particularly staff time, and meeting institutional and external demands for outcomes-based programmes.

This paper describes our approach to the delivery and assessment of a Level 1 circuit theory unit presented to a group of 40–60 students each year. The cohort includes full- and part-time students, where part-time students normally attend for one full day per week. The unit is presented in one semester of 15 weeks, comprising 12 teaching weeks, 1 'revision' week and 2 weeks allocated for end-of-unit assessments.

Some students do not have good time-management skills or may initially underestimate the commitment necessary to complete their course successfully. Providing timely formative feedback is therefore vital for students and teaching staff. A 12-week teaching period does not allow much time for remedial action by either student or teacher. Our experience has been that students who attend regularly and diligently complete all work set generally complete their course successfully.

The revised circuit theory unit

The Level 1 circuit theory unit provides the foundation for the study of electrical and electronic engineering, however many students find the mathematical content of the subject particularly challenging. In response to poor student attainment rates in this unit, the course team introduced a number of changes to the delivery and assessment of the subject at Level 1. The main rationale was to help students to structure and manage their own learning by providing frequent formative assessment.

The new unit 'signals and circuits 1' is a 20-credit point unit taught at Level 1 of programmes in electrical and electronic engineering. The unit has a nominal student workload of 150 hours in a 15-week semester. The teaching programme comprises:

1×1 hour lecture per week (for the entire cohort)
2×1 hour small group teaching sessions (groups of 20 approximately students)
1×2 hour laboratory session (groups of approximately 20 students)

The unit has been presented by two members of academic staff who deliver the lectures and small group teaching sessions, with a technician instructor supervising the practical sessions. The unit learning outcomes include a mixture of theoretical, practical and professional skills.

Assessment is by means of in-course work (weighted at 60%) and end-of-unit examination (weighted at 40%). The Southampton Institute assessment regulations require that students pass both elements with a mark of 35%, and also achieve an overall mark of 40% in order to pass the unit.

The learning outcomes are assessed by means of the following assessment instruments:

In-course assessment

Tutorial Workbook	Weighting – 30%
Laboratory Logbook	Weighting – 30%

End-of-unit assessment

2 hour closed-book examination	Weighting – 40%

The in-course assessment provides both formative and summative assessment. Students carry out a series of practical activities during supervised sessions that must be documented in a Laboratory Logbook. The format of the logbook is prescribed and each logbook entry is assessed against a standard set of assessment criteria at the next laboratory session. The criteria are published, with students encouraged to self-assess their work.

Students are set example questions related to the material presented in lectures and small group sessions. They are then required to record their attempts at solving the example questions in their Tutorial Workbook, with the work assessed by a member of staff at predetermined intervals during small group teaching sessions. All example sheets are written in objective question format, with a single unequivocal answer, generally a numerical value.[1] The assessment process confirms that students have attempted the set questions, obtained the correct answers, and that all appro-

priate working is documented in the workbook. Answers are also provided for the questions to allow students to check their own work. This approach minimises the time taken to assess the work, allowing assessment to take place within scheduled small group teaching sessions.

The assessment pack issued to students at the beginning of the unit includes:

- unit teaching scheme and assessment schedule for the tutorial workbook;
- example sheets with answers (objective question format);
- laboratory programme and laboratory sheets;
- laboratory logbook guidelines and assessment criteria.

This information is also made available via a managed learning environment (Learnwise) that provides off-campus access to the material. Learnwise provides a range of features including a noticeboard, 'to-do' lists and the facility to email all students enrolled for the unit.[2] These features are used to provide weekly reminders of impending deadlines, useful hints and tips, and other information relevant to the unit.

Attendance at teaching sessions

The course team believe firmly that regular attendance at teaching sessions is a critical success factor for the large majority of students. Attendance at practical sessions is also essential for students to develop the necessary practical and professional skills, in particular Engineering Applications 1 (EA1) and meet the learning outcomes of the unit.

Two initiatives have been developed to help encourage regular attendance.

- Attendance at small group sessions is monitored and cases of poor attendance are referred to the student's personal tutor. In more serious cases of regular or persistent non-attendance a polite notice, in the form of a postcard, is sent to the student's home and term-time addresses (Fig. 1). This has been found often to elicit a response from the student.
- No referral over the summer is possible for the unit practical work if the failure was due to poor attendance at practical sessions. Instead students are required to repeat the practical work when the unit is next presented. If a student is referred in several units this may delay progression to the next stage of their course. The policy is clearly documented in the student course handbook and the validated course document.

Student results

The unit was presented during 2000/2001 and the results obtained by a cohort of 43 students are shown in Fig. 2. 30 students (70%) passed the unit at the first attempt, with a further 6 (14%) passing the resit examination. A total of seven students (16%) failed the resit examination. The mean mark for the tutorial workbook was 72.6%. Perhaps this is not surprising given the nature of the subject material, and that


SOUTHAMPTON
INSTITUTE

Date as Postmark

Dear Student

Please make an appointment with your Year Tutor immediately to discuss your progress on the course.

School Administrative Officer
School of Computing and Digital Communications
Southampton Institute
(023) 8031 9666

AOS-SI-PC6

Fig. 1 *Example of postcard sent in cases of poor student attendance.*

answers were provided for all of the objective questions. The mean for the end-of-unit examination was 39.3% with an overall mean mark of 52.2% for the unit. This was consistent with other units studied by the cohort and is a considerable improvement on the results obtained for a comparable unit in previous years.

The results show that all students who completed at least 80% of the work set passed the unit at the first attempt. Four of the seven students who failed to pass the unit achieved a mark of less than 35% for their tutorial workbooks.

Students were asked to complete an end-of-unit questionnaire and the response to the unit was very positive, confirming that students believed that they had learnt a great deal from the unit, received feedback on their work, and that the material was organised and presented in a logical manner. Students also indicated that they would prefer to carry our more practical work using computer-aided design tools, although this was the only significant negative comment.

Discussion

The use of objective questions has significantly reduced the time taken to assess the tutorial workbooks. It was relatively easy to convert existing assessment questions into objective question format and one of the authors is a member of the Electrical and Electronic Engineering Assessment Network (e^3an) project team.[3] A core activity of this project is the development of peer reviewed question banks suitable for use either with computer-assisted assessment systems, or paper-based.[4] It is planned to pilot the use of computer-assisted assessment for this particular unit during the

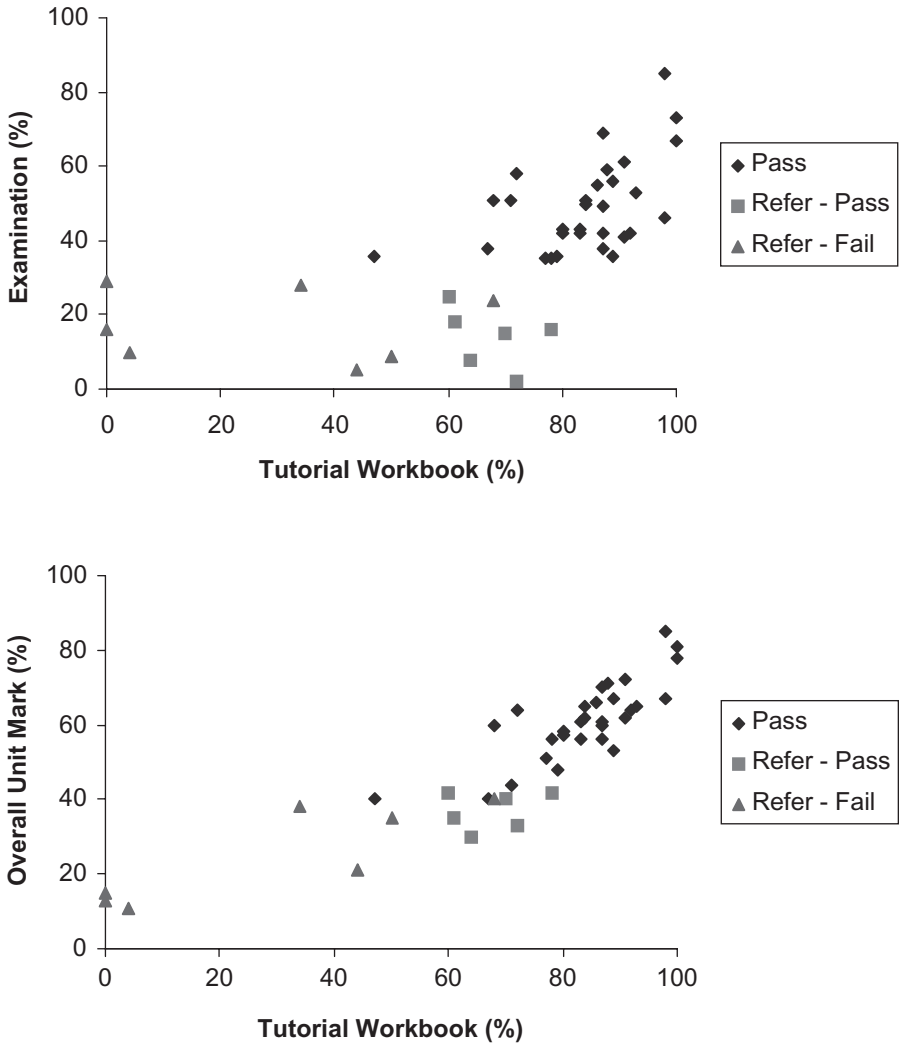

Fig. 2 *Student results for the unit 'Signals and Circuits 1'.*

2001/2002 academic session, in particular to help with the review and consolidation of material before the final examination.

It can be difficult to write objective questions that test higher level skills (i.e. synthesis and evaluation), however this is not an issue for this particular subject at Level 1.

Students were aware that the tutorial workbook made a significant contribution to the overall unit mark and the large majority directed their efforts accordingly. It is certainly possible for students to work collaboratively on their tutorial workbooks and seek assistance from other sources. For some students this is an effective way

of learning and ultimately they are still required to pass the end-of-unit examination. The tutorial workbook explicitly assesses the entire curriculum in an open and transparent manner.

Conclusions

The use of regular assessment that encourages attendance at teaching sessions has been found to improve significantly student attainment rates in a subject area that students traditionally find very demanding.

The programme of in-course assessments is used to help students structure and pace their learning, with formative feedback provided on a regular basis, generally weekly. Student motivation and performance has improved significantly. The use of objective questions has considerably reduced the time taken to assess the tutorial workbooks, allowing assessment to take place during scheduled teaching sessions.

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