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Use of Interviews for Assessment: A Case Study

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Abstract

While delivering a module on digital signal processing a series of one-to-one interviews were used extensively to assess undergraduate students. The interviews were organised so as to encourage students to focus on fundamentals before attempting to deal with more complex concepts. Feedback from the students about the process was extremely positive and the vast majority of survey respondents indicated that they found that the interviews motivated them to engage with course material effectively. This paper describes the module setup; the interview process used and discusses the results of the survey.

1. Introduction

During the first 4 weeks of a digital signal processing module students worked on a set of online quizzes in a computer lab at their own pace. As they progressed through the quizzes they could gain extra marks by taking part in one-to-one interviews with a course tutor during the lab sessions.

The interview questions were structured in such a way that a student had to have sound grasp of the basics before being allowed to progress to more complex concepts. Each student had access to interview questions beforehand and could request an interview whenever they felt they were in a position to perform well on a particular topic and in the event that a student couldn't answer a question they could simply retake the interview at a later stage without any penalty.

A survey of students found that the interviews helped to motivate them to engage with the course material with just two of 54 survey respondents indicating otherwise. This finding was supported by informal discussions with students and ad-hoc feedback in which students supported the both the module structure and the interview process, despite it being both a considerable challenge and, at times, somewhat daunting.

The remainder of the paper provides details of the module structure, the interview process and survey results, together with some observations of the authors who were the tutors involved in the module.

In summary, the structure and delivery of the module proved extremely successful from the perspective of both students and tutors and while considerable time was required to develop a framework to deliver and assess the module, once the framework is in place its delivery is sustainable with relatively low tutor effort. One issue with the approach presented is that it focuses on developing cognitive skills which lie at the lower end of Bloom's taxonomy [1].

2. Module details

The module deals with introductory material related to digital signal processing (DSP) and is delivered in year 3 of a four year honours degree programme in electrical engineering. The focus of the module is to ingrain fundamental skills and knowledge associated with digital signal processing which can then be applied to more complex problems. There is little emphasis placed on developing significant problem solving skills within the module, rather a focus is placed on developing key competencies that would be required in order to solve more complex DSP problems at a later stage in the programme. It is worth mentioning that the programme consists of a suite of modules which focus on developing group-based and problem-solving skills throughout its four year duration.

There is a follow-up module in year 4 which deals with more advanced DSP techniques and the authors have been responsible for delivering both DSP modules for the past four year. This has allowed the authors observe improvements in student understanding gained from modifications introduced in year 3.

Continuous assessment forms 40% of the overall module mark and is comprised of two key components: completion of online quizzes and one-to-one interviews. The remainder of the module mark is determined by a 3 hour open book exam and a half hour online exam.

The module is delivered over a 15 week period with a front-loading of student effort during the first 4 weeks to allow students partake in an industry based work placement initiative. During these first 4 weeks students attend four hours of lectures and four hours of computer lab sessions where they work on

practical signal processing problems. The problems are presented within a Virtual Learning Environment (VLE) and are mixture of short multiple choice style questions; calculation style questions; and problems that involve more substantial student effort but typically would require no more than 2 hours to complete. Students work on these online problems at their own pace and can continue to work on them for the 15-week period in an unsupervised setting. During the first 4-week period students were encouraged to help each other work on problems within the computer laboratory and students who were able to assist others were rewarded with additional marks (see Table 1).

The VLE also contains over 10 hours of video tutorials with each video being typically 15 minutes duration. The videos are focused on individual concepts which are reinforced and presented to the students in a unified way during lecture sessions. Students frequently review the videos during lab sessions in preparation for the problems and assessment interviews.

The videos and course notes played an important role during module delivery as they allowed tutors focus entirely on assessing students' ability rather than on explaining concepts during lab sessions. Over the course of the module a number of students commented that access to course material, i.e. video tutorials and online notes, was a particularly useful feature of the module. They felt that if they if they were having difficulty with a concept or online problem then the necessary resources were readily available.

3. Interview process

There are 8 interview topics each containing interview questions/criteria which are related to learning objectives associated with that topic. Each topic is then divided into a subset of interview criteria that a student must be able to deal with in a single sitting before being awarded any credit. The example provided in the following few paragraphs illustrates the process.

One of the interview topics deals with "filtering signals" and both the student and the tutor have access to the following list of interview criteria.

Table 1. Interview criteria for the topic 'Filtering Signals'

Level	Criteria
Level 0 0%	Unable to complete all of level 1
Level 1 40%	Explain low-pass, high-pass, band-pass and band reject filters. Design and implement a filter using built-in Matlab functions. Explain the term normalised frequency.
Level 2 70%	All above plus: Explain the terms passband, stopband, transition band, passband ripple and
	stopband attenuation. Design a minimum order filter to meet a filter specification.
Level 3 85%	All above plus: Explain the advantage/disadvantages between FIR and IIR filters. Explain the differences between chebyshev, elliptical and butterworth filter designs
Level 4 100%	All above plus: Deep understanding - able to engage in discussion easily without prompting and/or evidence of having assisted others with this topic

Each student is initially placed at level 0 (see Table 1) indicating they have not yet completed the criteria associated with level 1. In order to complete a level the student must meet all of the criteria associated with that level in one sitting; if a student is unable to demonstrate the knowledge/skills and satisfactorily meet the criteria listed then the interview is terminated and no marks are awarded. A student can only request an interview related to a particular level once all the lower levels have been completed and there is no limit to the number of interview attempts that a student has on a particular topic, with the only constraint being the time limit of the lab session.

Since approximately 16 students are present in a computer laboratory and these students could hear all interviews that were taking place, tutors would vary the way an interview was conducted, particularly if they got the sense that responses to interview questions were being 'memorized' rather than 'understood'. As an example, the question "What is a low-pass filter?" would often receive the response "it's a filter that removes low frequency content from a signal". In order to ensure that this phrase was understood the tutor might ask the student to explain what he/she meant by 'frequency content' or to illustrate the concept of a low-pass filter with a sketch.

For each topic the criteria associated with Level 1 represented the minimum set of knowledge/skills that the student would require in order to put this grouping of knowledge and skill to practical use. In the filtering signals example, it can be seen that the student cannot get any credit for only knowing the basic filter types (low-pass, high pass, etc.), he/she must also be able to demonstrate an ability to filter a signal, which also requires knowledge of normalised frequency.

Structuring the topics into different levels is designed to focus the students on the fundamentals before dealing with more complex concepts and encourages a broader understanding of the entire module content. This is in contrast with a typical written exam in which students can often perform well with deep knowledge of a just a few selected topics.

4. Survey results

The module has been delivered in the manner described above for the last two years and both cohorts were invited to participate in an anonymous online survey. The survey participants were presented with the following three questions:

- Did the interviews motivate you to engage with the course topics? *Yes (significantly) | yes (to an extent) | no*
- Did the online quizzes help develop your understanding of the course topics? *Yes (significantly) | yes (to an extent) | no*
- Would you like to see more modules organised in the same way? *yes | no*

Participants provided responses by selecting one of the options shown in italics after each question above. Students were also invited to provide additional comments on the module as an option.

There were 39 students in the current cohort, of which 27 responded to the survey, while 27 of 57 students in the previous year's cohort took part.

Table 2. Survey responses of current cohort

Did the interviews motivate you to engage with the course topics?		
Yes (significantly)	70.37%	19
Yes (to an extent)	25.93%	7
No	3.70%	1
Total		27
Did the online quizzes help develop your understanding of the course topics?		
Yes (significantly)	48.15%	13
Yes (to an extent)	51.85%	14
No	0.00%	0
Total		27
Would you like to see more modules organized in the same way?		
Yes	77.78%	21
No	22.22%	6
Total		27

Table 3. Survey responses of previous year's cohort

Did the interviews motivate you to engage with the course topics?		
Yes (significantly)	44.44%	12
Yes (to an extent)	51.85%	14
No	3.70%	1
Total		27
Did the online quizzes help develop your understanding of the course topics?		
Yes (significantly)	51.85%	14
Yes (to an extent)	44.44%	12
No	3.70%	1
Total		27

Would you like to see more modules organized in the same way?		
Yes	62.96%	17
No	37.04%	10
Total		27

5. Discussion

The original motivation for the use of interviews was to deal with the potential issue of inappropriate attempts of unsupervised online quizzes [2], whereby students could answer questions correctly even though they might not fully understand either the question or the solution they provided. This might occur, for example, if a student was to blindly copy a colleagues approach to a particular problem. The survey responses indicate that the interview process had the desired effect in this regard.

Another positive feature of the structure used is that students are encouraged to focus on the fundamental core competencies before attempting to engage with more complex concepts. Students cannot request an interview on complex concepts until they have demonstrated competency with the fundamentals. The authors consider this to be an important feature which is often lacking with other assessment approaches, including written examinations and group-based project work.

The results of the survey also indicate that the students found the structure of the module useful as they would like to see the approach adopted within other modules. This could be interpreted as meaning that the students found the module relatively easy but through informal discussions the authors got the sense that they appreciated they were developing useful skills and knowledge of a relatively high difficulty.

There are, of course, a number of limitations with the approach used. Perhaps the most significant is that the cognitive skills developed are at the more basic end of the scale (knowledge, comprehension and application, using Bloom's taxonomy [1]). It is because of this that the authors feel that the structure used here should ideally feed into modules which do encourage the higher cognitive skills of evaluation, analysis and design. With a growing movement towards a PBL style of delivery [3] the module structure presented here may form a useful basis for supporting modules, such as the courses used in the Aalborg model [4] which introduce the fundamentals of mathematics, physics and computer science.

Another issue is the significant time required to develop material such as online quizzes, video tutorials and notes. Tutors were in a position to focus on assessment, using interviews, as a result of such material being available and this is seen as being a key component for the successful delivery of the module in the manner described. It is also worth considering the negative impact the availability of

material has on student development, whereby students are not encouraged to source material for themselves and are thereby deprived of developing self-directed study skills. Inclusion of PBL style modules in parallel is likely to help mitigate this issue.

6. References

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