GROUP ASSESSMENT FOR COMPUTER SCIENCE PROJECTS

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ABSTRACT

This paper presents the findings of a study on group work assessment techniques within the context of a computer science project. We argue that diversification of group work assessment methods supports more open and fair assessment criteria, and that this divergence adds value to the process by maximising student responsibility for learning. Furthermore this diversification can also help to tackle the long-standing issues of plagiarism and collusion, which are often manifested within group work assessment.

Keywords

Group work, Assessment.

1. INTRODUCTION

There is increasing realisation, particularly in higher education in the UK, that group work assessment tends to be dominated by a relatively narrow range of assessment instruments, practices and processes [1]. For a long time, group project reports have been an appropriate form of summative assessment, and they enable lecturers to determine the level at which a student group is performing in terms of knowledge and understanding [17]. However, the group work assessment infrastructure does not always include the other element of evaluation, namely the formative aspect, which allows for feedback to students and thus improves the quality of learning.

Furthermore it is often argued that any assessment format or process disadvantages some candidates, and the continual use of the same few assessment methods repeatedly disadvantages the same candidates [2]. A student's success in higher education depends disproportionally on mastering these few assessment formats. It is therefore important to diversify assessment so that candidates have a greater opportunity to demonstrate their true potential on at least a few of the assessment occasions they encounter [3]. We argue that the diversification of group work assessment produces a fairer process and aids understanding of the subject domain.

There are a number of ways in which assessment can be diversified: self-assessment, peer-assessment, presentations, posters, exhibitions, portfolios, reflective logs, computer programs, and conferencing [3]. With the proliferation of assessment criteria within mainstream computing, it has become apparent that a variety of different assessment techniques may need to be deployed. As such this paper does not seek to prescribe any particular conceptual configuration for group work assessment, but instead examines some of the possible techniques that may be used in the schematic assessment of group work within mainstream computer science courses.

We focus our discussion on the merits or otherwise of four of the techniques within the context of group work assessment issues, namely self-assessment, peer assessment, poster presentation and portfolios,

2. GROUP WORK

"Group assessment is the use of tasks carried out by or in a group for the purpose of assessing students' achievements" [16].

Group work presents an opening for additional variety in the learning process by allowing students to adopt a more proactive independent approach to learning, as opposed to simply being passive recipients of knowledge. Collaboration with peers through group work can enable students to cover far more material then on an individual basis. Group work can play a predominant part in the quest for continuous improvement in the delivery and quality of education. It promotes the development of a range of skills that are increasingly needed in academia and in industry, such as organisation, teamwork and interpersonal skills, and peer feedback [4]. In addition, the demands industry places on individuals acquiring diversified, transferable skills, and the ability to work in a team,

gives further precedence to the concept of encapsulating group work within mainstream computing courses.

Group project work forms a significant proportion of many computer science degree courses, and exists in the syllabus for proactive reasons. Typically group work exists in the second year of a computer science degree course, and also in the final year of a four-year MEng course. In the case of accredited courses in the UK, the assessment criteria are guided by the requirements of the accrediting body (normally the British Computer Society or the Institution of Electrical Engineers).

The introduction of group work also has its shortfalls which manifest themselves in issues of plagiarism and collusion [16]. This paper also considers how student participation in the assessment process and techniques such as self-assessment and peer assessment may help address these issues.

3. INVOLVING STUDENTS IN THEIR OWN ASSESSMENT

Students can sometimes be more objective and better at evaluating their own or their peers work compared to a tutor, as students are actively immersed and involved in the total process [5,6]. Self-assessment and peer assessment are effective ways to deepen and broaden the learning experience, by engaging the student in applying assessment criteria to evidence. Students can ascertain a great deal about their attempt at a task by appraising other students' attempts at same task [8]. Students can also learn more about a task by comparing their own judgements about it with those of fellow students. Another advantage is that it encourages students to become self-directed learners [5]. Increasingly one of the main purposes of higher education is to allow students to develop transferable skills, including skills on reflection.

Self-assessment requires students to reflect on their progress and to become critical about their own work and take responsibility of their learning [6]. Students who know how they are progressing are much better prepared to achieve their potential, and to demonstrate it in traditional exams and coursework. Furthermore self-assessment skills are invaluable in context of life long learning and are useful to students in the context of continual professional development after achieving their university qualifications [3].

Peer assessments are encountered by life long learners during the processes of performance appraisal and teambuilding, and they therefore become adept at assessing each others work and contribution fairly.

4. SELF ASSESSMENT

Self-assessment can be considered as individual reflection, whereby an individual is encouraged to critically analyse their own learning process. In the context of group work, this includes reflection on the process of working in a team [5]. Self-assessment can be approached in a variety of ways. For example, a series of short questions may target specific issues the student is required to reflect upon. Reflection on the student's progress may be better addressed by formulation an essay type question, encouraging the student to reflect wider on their progress than would be possible with a constrained set of specific questions.

The advantages of self-assessment include improving student learning by passing on evaluative skills and critical judgment. In addition, self-assessment can foster reflection and can extend the learning process [6]. Self-assessment compels the students to take responsibility for their own learning, as well encouraging them to develop their decision-making skills and monitor their progress [7].

From the students' point of view, self-assessment has the added advantage of allowing the student to present relevant information that may not be covered by other assessment methods. However, there are disadvantages with this type of assessment. The mechanism relies on students acting professionally, and individual differences can be perceived as discrepancies in self-assessment [6,7]. As this form of assessment is new to computer science modules, students may need guidance on how to critically evaluate their contribution to a group project [6].

5. PEER ASSESSMENT

This mode of assessment is often used within group work, where students assess each other's contribution to the project and their participation in the team [18]. Peer assessment may be used as a reflective tool, so that students are asked to consider performance in terms of set criteria or outcomes. It is usually only a contributory part of assessment strategy and in combination with other mechanisms [6].

There are many advantages of peer assessment. Students actively participate and take responsibility for the assessment process, thereby making them more independent, responsible and involved. Peer assessment encourages students to critically analyse work done by others rather then simply receiving a mark as feedback [9]. A recent study which involved the deployment of a peer assessment exercise on a large programming module has demonstrated that this form of assessment helped students to develop their understanding of computer programming, and that

peer assessment is therefore a valid assessment and learning tool within Computer Science [15].

Peer Assessment holds much promise and is important in helping to clarify assessment criteria as well as being an arrangement for giving students a wider range of feedback [20]. Peer assessment encourages students to be accountable to the team and perhaps go someway towards avoiding the intricate issue of freeloading [6].

The issue of freeloaders has always tainted group work assessment. Tutors can assess presentations, reports and program listings, however the tutor can having difficulty in addressing the degree to which each individual team member contributed, only the students will be able to identify this correctly. A principal advantage of peer assessment (and self assessment) exercises is that students who fail to contribute can be identified [3].

However there are drawbacks to peer assessment. Students are required to comment on and judge their colleagues work, and this has a vital role to play in formative assessment, but for it to be successful it requires students to be honest, otherwise it may be seen as unfair. Students may lack the ability to evaluate each other, and students may allow friendship to influence their evaluations [1,3].

6. POSTER PRESENTATIONS

The use of poster presentations, in the Computer Science and Engineering departments of the University, have been a popular assessment technique for group projects, The advantage is that the tutor can assess the verbal fluency, the communication skills, and the creativity of the group, which are qualities that cannot easily be tested by written documents. Furthermore it is possible to ascertain what element of self confidence the members have, as well as determining their ability to argue a point in a discussion, thereby giving a tutor the unique opportunity to establish the actual level of understanding both of the team and individuals. It is possible to verify the individual contributions to the work of the group.

Assessment of a variety of diverse groups can be problematic and in order to ensure fairness it may be appropriate to have a set of basic questions which are common to all groups. Careful questioning by experienced and specialist tutors with secondary questions make it possible to identify passengers and other non-contributors, and to assess accurately the level of understanding [5].

Use of poster presentations can, however, be stressful, which can be counter-productive, and so measures should be taken to familiarise the students with the procedure in advance of its use.

7. PORTFOLIOS

Some conventional forms of assessment often test only a narrow range of knowledge and abilities, and portfolios can assist in addressing this issue. Portfolios are not often used in computing courses and therefore there is no standard format for a portfolio. A portfolio can take the form of a variety of evidence, and this diversity can be a strength. A portfolio allows the tutor, and more importantly the student, to decide what will constitute their evidence [8]. This diversification allows the portfolio to support the integration of learning from different parts of the course and beyond. Further advantages of portfolios are they can support the development, demonstration and valid assessment of a wide range of personal professional and academic capabilities, both inside and outside a program of study. They can show reflection on and analysis of evidence and learning [2].

A portfolio contains evidence, which can be program listings, test data reports, user manual, and other items. The evidence can take a variety of forms including multimedia portfolios, video, audio, and web sites, or paper based. They can be CD–ROM format so easier to access from anywhere. Most importantly evidence is produced throughout the duration of the project, but it is fundamental that it must be appropriate for the given assessment criteria.

At present, portfolios are not commonly used in mainstream computing courses, although some institutions have experience. For example, Northumbria University has successfully used portfolios in variety of modules such as theory and design, Professional Management issues, e-business, object oriented modeling, and social and current issues in computing [7].

A portfolio adds value to the assessment process because it forms a collection of a variety of the students work created at different stages of their learning process rather then a single summative process such as an essay or program listing. Furthermore during the its compilation the student can assimilate, articulate and criticise their work which a program listing doesn't easily allow [2]. Within a portfolio there is implicitly diversification of assessment criteria by assessment method. Above all the students find it an enjoyable learning experience, which allows them to conceptualise and formulate their ideas and thoughts, resulting in better understanding of the subject area and in deeper learning. Through the analysis the students can make further sense of the work they have done, as it involves them analysing and interrogating it. They can also argue what the evidence shows, and explain what they have learned, what capabilities they have developed, and how far they have moved towards the learning outcomes [2,8].

The assessment of a portfolio often starts with critical reflection rather than from the evidence [8]. The relationship between evidence and critical reflection should be intimate, and the mapping between them should be evident. A multimedia hypertext presentation can make reference back and forth between critical reflection and evidence particularly easy [2,8].

Portfolios are seen to be a fairer means of assessment as they represent a multiplicity of work done over a period of time. Moreover the students are responsible for identifying which elements of work appear in the portfolio and which constitute evidence of work done and learning achieved. Due to the increasingly growing numbers of students entering computer science courses it is important that the assessment process makes efficient use of the assessors' time. However a portfolio may take a long time to mark, longer then essay. The majority of the time is consumed in cross-referencing the critical reflection and evidence processes [2]. The process can be made much quicker if the students specify where their critical reflection addresses relevant specific pieces of evidence, so that the assessors can make a confident judgment rapidly. [8]

Before the whole portfolio is presented for assessment sections can be offered for formative assessment and feedback. The student can then use this feedback for their own reflection and analysis, in order to identify gaps in their learning.

8. COLLUSION AND PLAGIARISM

Plagiarism in computing is a problem [7][16]. Portfolios are an extremely effective technique in addressing this issue as they are collections of individual work with substantial variation. Students are encouraged to talk about their portfolios, and this also helps manage collusion and plagiarism

Portfolios exhibit reflective practice. The students are encouraged to comment on the material and discuss and compare the information, and this also contributes to portfolios' individualities.

9. DISCUSSION

The focal point of this paper stems from the recognition that some conventional forms of assessment test only a restricted range of knowledge and abilities, and by using the same few assessment formats some students may be repeatedly disadvantaged [1]. It is increasingly recognised that one of the preferred outcomes in education should be the increased ability in the learner to make critical, analytical and independent rulings of their own and their peers work.

Peer assessment and self-assessment are seen as a means by which these general skills can be developed and practiced. They also provide increased feedback, and in terms of summative assessment studies have found student ratings of their colleagues to be both reliable and valid, with no difference between lecturer and student ratings of assignments [8]. Furthermore they can encourage a greater sense of involvement and responsibility. However awareness of the drawbacks is important, since the mechanism relies on students acting with integrity, and students must be given training in order to enhance their ability to evaluate each other.

Poster Presentations provide a means to test those group work abilities that other forms of assessment such as group reports couldn't address. They have proven to be an effective way of establishing the team's communication, discussion and their ability to argue a point in a discussion.

Portfolios are a "valid reliable, fair and economical" means of assessment which "stimulate students to produce work which they value" [7]. Although Portfolios allow for creativity and freedom, computer science students are often unused to portfolio creation, thus guidance criteria needs to be established.

10. CONCLUSION

We have compared and contrasted four different methods of assessment, which address a range of diverse evaluation issues. We have argued that the diversification of group work assessment promotes a fairer means of evaluation, tests an extensive range of knowledge and abilities and promotes a clear focus on reflection which establishes a method of improving the quality and dept of student learning [19].

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