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The need for higher education reform – Problems faced with assessing collaborative team based work: Implications for changes in assessment procedures

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With a rise in group work across schools and universities, there has been a great deal of research regarding the beneficial impacts of teamwork on learning. However, research is limited in the area of assessment of group work in mathematics at the tertiary level. This qualitative based study is an investigation into problems faced by tertiary students' with assessment of group work in mathematics. This study is part of a larger project aimed at investigating the effects of collaborative learning methods in higher education mathematics. The overall objective is to facilitate learning that is more meaningful and to promote deeper understanding of concepts covered in first year mathematics. Twenty students studying a first year mathematics subject were involved in in-depth interviews. Implications for assessment policy are discussed with some recommendations made.

Introduction

Many educational institutions are shifting from traditional teaching methods, which have often relied on individual work, to methods, which integrate group academic work. Collaborative learning (be it in face-to-face or computer-supported environments) is an emerging area for research in education that integrates information, communication, and technology to support learners who work together to achieve common goals.

The objective of our study is to investigate attitudes of tertiary students towards assessment in collaborative group settings. This project will inform the practices of both staff and students and in particular, will identify what is required for the successful evaluation of learning conducted in collaborative group settings. We will explore the implications of such methods in mathematics instruction in higher education.

Research suggests that benefits can be accrued through academic group work. It is reasonable to expect that there would be some diversity of opinion among students regarding the requirement that they participate in groups to complete academic work. For instance, Butts (2000) noted that it is common for students to *not* enjoy group work. A certain dilemma arises: *group work is demonstrated to have highly beneficial results, but is not enjoyed by many students*. If we hope to improve student attitudes towards group work, it is important to first explore the issues such as assessment that might influence such attitudes. This information can then be used to address student concerns and to explore possible techniques for improving students' attitudes and effectiveness of groups.

Traditional, individual based projects are easy to attribute to one student. However, when evaluating a group task or project, academics face a more difficult problem – do all students receive the same grade, and if so, what system should we have in place for determining how to differentiate the contribution of one student from that of his or her group members. This paper discusses the concerns of assessment in collaborative learning.

Significance and Innovation

Groups…hold the key to solving such societal problems as racism, sexism, and international conflict. Because groups are building blocks of society, any attempt to change society will succeed only if the groups within that society change (Forsyth, 1999, p.xi)

One way to prepare future employees for such a work environment is by having them work in groups in academic settings (Thomas, 2001). Group work is believed to be beneficial not only in a work environment but also has many positive results in academic settings (DePree, 1998; Thomas, 2001). *Why then are such methods not widely integrated into mathematics instruction at the tertiary level? How do we promote these methods amongst staff and students? What do we need to do to ensure implementation of appropriate assessment methods for group based work?* Group based learning requires an understanding of the collaborative learning process, which is fashioned by an individual's ability, learning style, motivation, group members' individual behaviours, the dynamics of their interaction

and evaluation of group processes. This increases the complexity of the environment by generating a significant amount of additional information concerning the students and their relationships. In order to successfully implement collaborative learning methods, it is necessary to extend the pedagogical models to include this new knowledge about collaboration and perhaps even design new models to specifically represent this information.

Conceptual framework

When people work collaboratively, they bring their own framework and perspectives to the activity. They can see a problem from different perspectives, negotiate and generate meanings and solutions through shared understanding (Selinger, 2001). Collaboration requires one to think of the participants, not simply as individuals, but also as a community that works towards shared goals, the achievement of which depends upon collaboration. Vygotsky (1978) described the difference between an individual's current level of development to his or her potential level as the *zone of proximal development* (ZPD). He believed that the construction and assimilation of knowledge that can be developed in collaboration exceeds that which can be attained alone. Vygotsky's social constructivist view envisages learners constructing their own knowledge rather than acquiring it. Thus, the value of learning or construction of knowledge is increased through social interaction. The constructivist approach to learning emphasises authentic, challenging projects that include students, teachers and experts in the learning community with a goal to creating valuable, beneficial experiences that are more closely related to the collaborative practice of the real world.

In the higher education sector, the term 'assessment' has taken on a rather broad meaning. It has been defined by Rowntree (1977) as getting to know our students and the quality of their learning. Ramsden (1992) describes it as a way of teaching more effectively through understanding exactly what students know and do not know. Thus, assessment enables teachers to understand the processes and outcomes of student learning. It helps to determine what students actually achieve in their study. Such meaningful information on student learning can be used for academic improvement. It is not an end in itself but a means to an educational purpose. Assessment plays a key role in determining the quality of student learning. The assessment methods we adopt will encourage different approaches to learning.

Methodology

Based on the assumption that students' opinions about group work may be linked to the degree to which students' feel that their efforts are effective and lead to desired results, this study will investigate issues students have regarding assessment of group based work, since assessment plays an important role in a students' success at university.

Our approach to the overall investigation was to use a combination of qualitative and quantitative methodologies to explore students' experiences of group work in engineering mathematics (see D'Souza & Wood, 2003d; 2003e for details on the overall project).

Participants in the larger study comprised of first-year engineering students studying a core mathematics subject as part of the requirements of their engineering degree program. Students were invited to participate in the study that was voluntary due to ethical considerations. Out of a lecture group of 440 students, 345 consented to participate in the overall project. In this paper, we are reporting on the qualitative aspects of the research, particularly, students' opinions about group based assessment and whether they thought the process of assessing was fair or not. Students who volunteered their time to be interviewed were involved in in-depth interviews lasting 30-40 minutes on average. The students were involved in collaborative group work all through semester in the form of weekly tutorials. Tasks were carefully designed such that they would encourage discussion and promote collaboration. Twenty students consented to be interviewed comprising of six female and fourteen male participants. To give readers an idea of how the group tasks were assessed,

Table 1 contains a sample assessment breakdown for one such collaborative tutorial. Each of the weekly tutorials consisted of questions across four areas – technique, concept, language, and application.

Table 1: *Assessment breakdown for sample collaborative based task.*

Allocation of marks for a sample tutorial				
Attendance	0	1		Individual mark
Participation	0	1		Individual mark
Technique Question	0*	1†	2‡	Group mark
Concept Question	0	1	2	Group mark
Language Question	0	1	2	Group mark
Application Question	0	1	2	Group mark
Minimum mark that can be attained	0			
Maximum mark that can be attained	10			

Results

The interviews were transcribed, analysed, and categorised into themes. Only responses pertaining to assessment of group work are reported in this paper.

A major issue that arose was the case of *unequal workload*. It is no doubt very annoying when one member of a group does nothing at all to contribute to the task on hand and can be very frustrating. If one group member does not contribute as much as the others, then this will often leave the other members frustrated and the student who is not contributing will not really learn anything. Other members need to recognise that the non-contributing student needs to add more to the group. When students are placed into groups, many of the hard working students do all of the work and the 'lazy' students do nothing and still receive the same grade. This is not fair to those who have worked hard. Not everyone in the group will participate. Some students rely on others to do the work for them. These students usually receive the same grade, which is not fair to the students in the group who did all of the work as one girl pointed out:

[Quote from student]: *I think well, I can imagine that you know some of us sit down and do it and someone doesn't and they're like 'just put my name on it' or something and that does get a bit annoying cos they don't contribute and so that's one thing that – one negative aspect of group work – the ones that don't contribute kind of get the marks or not the marks you really want to get.*

The other side of the coin is when one member in the group is the only one that is 'able' to do the work and the rest just sit back and watch, it can get very frustrating if this one student realises that he or she is doing all the work, as one student commented (this student is part of a group that has a very smart member who tackles most of the tasks):

[Quote from student]: *...it's not fair – like one boy sitting there can do all the questions and three other boys can watch or girls you know and I don't think that unless you have teacher that can monitor questions and all kids putting their name down on what they did – it's not fair – it's good for students like me who possibly aren't as gifted at maths as others because it pulls our marks up whereas say student X for instance, his marks will be pulled down because he'll be relying on myself and student Y to do questions whereas he only can do two questions in a set amount of time and if we did the other two and we don't get as high a mark as he would, we're sort of pulling him down so in a way it's hmm sort of striking up an equilibrium between gifted and not so gifted students.*

This comment comes from a female student in a group of four members:

[Quote from student]: *Hey, its great cos I've been riding on the back of intelligent people. I'd be really annoyed if I was in a group that didn't have as intelligent people because not only would I get frustrated with things I couldn't do, and the fact that nobody else could do them so not only would we do badly but I have no possibility of having someone in my group explain it to me, so the assessment*

* A mark of zero denotes inability to provide a 'correct' answer.
† A mark of one denotes an ability to provide a 'partially correct' answer.
‡ A mark of two denoted an ability to provide a 'complete right' answer with explanations if need be.

for me at the moment is really advantageous but I can see how it can be really bad if the tables had turned certainly.

Discussion of Findings

There were students that used the resources of the group to get correct answers to problems but may not have understood the procedures for solving the problems and possibly did not try. They were not actively engaged in constructing solutions to problems, but were merely using the work that other students had done.

Yet, there were others that had difficulty understanding how to solve the problems and used the resources of the group to obtain the correct answer and to understand the problem solving procedures. Without the collaborative experience, they probably would not have been able to solve the tasks set out.

Research in instructional settings shows that there are many factors influencing group functioning and possibly group performance. Factors shown to influence group processes in the classroom include composition of the group on student characteristics such as ability, gender, ethnic background; preparation of students for group work; and ways in which group interaction is structured (Webb, 1991). Ensuring that every group has at least one able member; rewarding groups on the basis of the performance of all group members; providing students with training in communication and interpersonal skills; giving them practice in collaborating with others; requiring them to discuss issues, and ask each other probing questions all have positive effects on group functioning and may also foster better attitudes towards group based assessment. Intentionally or unintentionally, groups may differ widely on these factors.

This paper set out to convey the message about the importance of small-group collaboration in instruction and the emphasis on authentic assessment that closely links assessment with instruction. What students can accomplish in teams is important to potential employers who are increasingly using work teams to respond to global competition (Hackman, 1990). Assessing students in groups provides information about group productivity and group effectiveness that individual assessment of student skills does not. Group assessment makes it possible to measure students' ability to interact and collaborate with others. Team effectiveness involves many dynamic processes, for instance, coordination, communication, conflict resolution, decision-making, problem solving, and negotiation (Salas, Dickinson, Converse, & Tannenbaum, 1992). Observing students collaborating with others makes it possible to evaluate their ability to work with others and their ability to monitor and shape their own behavior (Redding, 1992). The drive toward authentic assessment calls for complex problems in realistic contexts (Meyer, 1992). Complex problems may be too intimidating for students to work on alone but may be better accomplished if they can work with others.

Implications for assessment reform

Educators and policy makers have invested a fair degree of confidence in formative, authentic assessments as a promising tool of education reform, the goal of which is to enhance students' development of critical thinking skills, writing and communication skills, multidisciplinary understanding, and social competencies. Assessment reform, which involves the shift from multiple-choice, norm-referenced tests (summative) toward performance-based (formative) assessments, is based upon the assumption that the latter are more pedagogically valuable and more accurate reflections of student achievement than the former. In addition, many educators claim that performance assessments are more interesting for students, and therefore, engage students in the assessment process.

Studies on formative assessment clearly point to the importance of regular student self-assessment as part of formative assessment. Self-assessment involves reflection on one's learning strategies as well as analysis of one's work. The implications are for a systematic

approach by teachers underpinned by a belief by both teachers and students that the process of self-assessment helps learning. Feedback is also vital as it contributes to learning if students are helped to act upon it. This would mean focusing feedback on tasks and the learning strategies used by students, using descriptive feedback that gives details of why answers are correct or wrong, consideration of the oral and/or written dimensions of feedback and how feedback could be tailored to individuals. The drive towards more authentic, formative assessment calls for complex problems in realistic contexts. Complex problems may be less intimidating to students if they can work with others collaboratively. This would mean designing better materials than that which is currently available, materials that would foster understanding and self-reflection.

Concluding Remarks

The predominant purpose of assessment reform is to enhance student achievement in terms of critical-thinking, problem-solving, and good writing and communication skills. This study has indicated that there are problems when assessing collaborative group based work. It is possible to carry our group-based assessment in an educationally sound way. Some care is needed though, justifying clearly both the use of a group task and the use of that task for assessment purposes. Moreover, when group work is to be assessed, the method is to be explained to students in a clear and unambiguous manner. Students will need some training or practice in relevant skills. Formative assessment is very demanding. Changes in classroom practice are central to its effectiveness so the accomplishment of formative assessment will mean changes in pedagogy. There is a need then to raise teachers' awareness of what formative assessment is, the important role students can play in terms of self or peer assessment, why formative assessment is important and how it can be incorporated into the teaching and learning process of mathematics at university. Formative assessment implies allowing students to take control over their own learning and is something that happens on a continual basis. There is a need to raise the status of formative assessment in the eyes of teachers (and students). The success of assessment reform as a tool to enhance student achievement remains to be rigorously demonstrated.

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