

The Immediate Feedback Assessment Technique (IF-AT): An Innovative Teaching Technique for Human Resource Management Students

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ABSTRACT

This paper aims to further contribute to the growing literature on Team Based Learning in higher education and employs the highly useful Instant Feedback Assessment Technique (IF-AT) in a study with a group of undergraduate university students in a Strategic Human Resource Management class at an Australian university. It was found that through the use of Team Based Learning and the incorporation of the IF-AT students' skills in the areas of communication, overall learning, cognitive and interpersonal skills through the use of teams or groups of students was enhanced. Suggesting that the potential of instant feedback could help to foster student engagement, encourage interaction between students and provide immediate feedback on student understanding.

Keywords: Assessment, Immediate Feedback, Teaching Innovations, Higher Education

INTRODUCTION

Business needs have changed and so have the knowledge and skills required of business school graduates. "The traditional model of business education, where professors lecture and students work individually with little interdependence with respect to their performance and grades is not in line with the business community's needs" (Siciliano, 2001:8). This realisation has resulted in recommendations that curriculum and teaching methods be modified to enhance students' skills in the areas of communication, cognitive and interpersonal skills through the use of teams or groups of students (J. Kunkel & Shafer, 1997; Siciliano, 2001). The literature on team based learning (TBL) and group work in tertiary environments is diverse. TBL has been used in cancer education (Haidet & Fecile, 2006), classroom design in an agricultural economics learning environment (Espy, 2008), nursing education (M. Clark, Nguyen, Bray, & Levine, 2008), legal studies tertiary classroom environments (Dana, 2007), civil engineering (Yost & Lane, 2007) and many other areas. The following themes have emerged from the analysis of this literature: cooperative learning, problem based learning, technology and TBL, decision making, engagement and action learning, and insights from psychology on TBL. In this paper, however, literature is mainly drawn from Higher Education and from the higher education literature from the fields of Management, Accounting and Psychology. One sticking point for TBL within a higher education setting is the assessment of team-based projects. The literature on feedback assessment approaches relevant to the concepts of TBL is briefly reviewed and the paper reports on a case study of the implementation of an innovative teaching technique, the Immediate Feedback and Assessment Technique (IF-AT) with second year undergraduate Human Resource Management students at an Australian university.

Team Based Learning

A number of authors have provided a thorough general overview of team based learning. Much of the literature emphasises the importance of teams in organisations and the imperative to engage in team building. This is the stance taken by Hill (2001) who emphasises the importance of team building, personality, culture and communication in organisations. He particularly explains the building blocks necessary to support a TBL initiative (trust, respect, understanding and team spirit) and the specific roles within working in TBL, from individual member to team leader. A more widely cited overview of TBL is however, provided through the works of Michaelsen and his colleagues (Michaelsen, 1998; Michaelsen, Black, & Fink, 1996; Michaelsen, Fink, & Knight, 1997; Michaelsen, Knight, & Fink, 2004).

Michaelsen (1998) focuses on Higher education and argues that implementation of team building needs to take place at different points in time: before class begins, during the first day of class, during each major unit of instruction and near the end of the course. He identifies four key principles that govern the effective use of learning teams at these points in time. These are: 1) groups must be properly formed and managed, 2) students must be made accountable for their individual and group work, 3) group assignments must promote both learning and team development and 4) students must have frequent and timely feedback. Similarly, Kremen-Bolton (1999) describe a

teaching model for instructors to improve student satisfaction and performance associated with team learning through effective coaching. The model identifies three coaching interventions during a semester course: starting student teams off on the right foot; helping teams manage diversity and conflict; and helping students learn from their teamwork experience.

If the role of coaching in TBL is fostered and Michaelsen's key principles are adhered to, there is evidence that team learning can be used to improve student retention (Kreie, Headrick, & Steiner, 2007). In a study where team learning was implemented in an introductory information systems (IS) course, Kreie et al (2007) found that successful use of team learning significantly increased student retention. The results of the study therefore support the use of the TBL approach as an effective, cooperative learning experience for first year students. Even though the study did not show that overall student performance significantly differed between a more traditional teaching approach and team based learning teaching approach, the fact that the overall average did not drop and that more students completed the course makes using TBL worth considering.

A related notion to TBL is the concept of cooperative learning (Ballantine & McCourt Larres, 2007a; Lancaster & Strand, 2001; Ravenscroft, Buckless, McCombs, & Zuckerman, 1995; Siciliano, 2001). These authors have all argued that cooperative learning is a useful pedagogical approach. Even when academic performance and student attributes were not found to differ significantly between cooperative and a more traditional learning environment, it is argued that cooperative learning provided further structure to the course and encouraged students to be more actively involved in the subject (Lancaster & Strand, 2001).

There is a related body of literature that suggests that groups and teams can make decisions better than individuals alone (Birmingham & Michaelsen, 1999; Hua, Jiang, & Liang, 2007; Watson, Michaelsen, & Sharp, 1991). In Watson et al's (1991) study the objective was to analyse the extent to which increased experience in group work would affect group versus individual problem solving. The intensity and duration of group involvement for subjects over 30 hours was extensive. The findings strongly support the value of group-consensus decision making both in task forces and in ongoing organisational groups as the results were overwhelmingly in favour of group decision making across time.

TBL decision making is also related to the concept of action learning. Swenson notes that "action learning, where individuals learn by doing, is based on the solution of real problems while working with others who are engaged in managing real problems" (2001:579). This process commonly involves students trying to implement actions, as in decision making, and not merely analysing situations and recommending strategies. Using this situated learning method, skills and knowledge are taught and acquired in contexts that are similar to real-life work situations. One way of employing the ideas of action learning in management university education is through case based modelling CBM (Lyons, 2008), which consists of providing the students with a case, identifying problems and opportunities in the case, asking the participants to create scripts (routines and activities) for manager interventions in a given problem in the case and then practicing, fine tuning and improving those scripts for other work related scenarios. This instructional model is grounded in the concept and theory of experiential learning, where skill building and decision situations can be embedded in case material.

Aligned with TBL and cooperative learning is the concept of problem based learning or PBL (Brownell & Jameson, 2004; Kloppenborg & Baucus, 2004). PBL is a learning model that capitalises on synergies among cognitive, affective and behavioural learning. It focuses on solving real-world problems, helping students appreciate multiple perspectives of an issue, recognising non-rational (emotional) elements of decision making and confronting ethical quandaries. PBL's goal is long term learning that results in behavioural change and not just conceptual mastery. PBL commonly involves engaging student teams in an activity that has a problem which serves as a stimulus for subsequent learning. In teams, students learn how to define and solve problems, weighing pros and cons and wrestling with alternatives (Brownell & Jameson, 2004). Due to this team focus, it is clear how PBL relates to TBL and cooperative learning.

Specific evidence of the benefits of cooperative learning can be found in the studies by Ravenscroft et al. (1995) and more recently, Ballantine and McCourt-Larres (2007a). These benefits are respectively better performance and improvement of students' generic skills. In the Ravenscroft et al.'s study, two groups of students in an accounting class were compared. One group was assigned to heterogeneous study groups but was graded entirely on individual performance. Students in the second group were also assigned to heterogeneous study groups but these students were graded on both individual and group performance. The results indicate that the performance of

students in the second group was substantially better than the performance of students in the first group. The Ballantine and McCourt-Larres study also examined cooperative learning of accounting students. The objective was to evaluate final year undergraduate students' opinions on the effectiveness of a cooperative learning environment in delivering generic skills for their future professional accountancy careers. The findings showed that students of different academic abilities believe they had enhanced their generic skills as a result of engaging in cooperative learning. Siciliano (2001) stresses that businesses recommend that curriculum and teaching methods at universities be modified to better develop these generic student skills, such as cognitive, communication and interpersonal skills through the use of student groups in the learning process.

Learning in groups and teams can benefit from using technology (Carnaghan & Webb, 2007; D. Clark & Gibb, 2006; Dineen, 2005; Hutchinson, 2007; Shrivastava, 1999; Williams, Duray, & Venkateshwar, 2006). In 1999, Shrivastava introduced the concepts of online learning communities as a way of understanding how university education in management can be organised to incorporate emerging digital technologies, such as the Internet and new television and video broadcasting technologies for classroom instruction and distant learning.

Since that time, the use of online learning environments has flourished, and notably so in the context of TBL, group or cooperative learning. For example, Hutchinson (2007) examined how cooperative learning can be combined with Online Learning Environment (OLE) factors (such as students' e-learning approaches). The author also presented a conceptual framework to represent this relationship as a constructive teaching practice. Clark and Gibb (2006) found that through innovative virtual team exercises, cognitive, affective and action-learning outcomes can be achieved among management students. While Dineen (2005) described the implementation of a virtual exercise, TeamXchange, in an undergraduate, Organisational Behaviour course. Through this online team-based exercise it was found that TeamXchange enhanced student learning and engagement through collaboration in virtual teams.

Effective Assessment

Incorporating team work into classes can be problematic due to uneven effort of group members, getting everyone to participate and making sure everyone is actually contributing in the team (Gueldenzoph & May, 2002). Many students have negative perceptions of group work due to experiences of working in dysfunctional groups, social loafing or free riding. Even though there are these negative perceptions of group work, employers still state that a key learning objective of graduates be that they are able to work in team or group environments as that is what is mirrored in the work force. Due to this feedback from employers and an overall need to produce graduates that are capable of working in a team environment we have seen group projects become an important component of higher education (Friedman, Cox, & Maher, 2008).

Yet, while the benefits of cooperative and problem based learning may appear to be great, there is often a fear that some group members may be getting a free ride on the efforts of others. This is an issue that has been studied for some time. The origins of the work on cooperative and problem based learning, the use of technology in TBL, decision making as well as action learning, can be typically traced back to core psychology literature on social loafing (Harkins & Szymanski, 1989), motivation in groups (Kerr, 1983) and more contemporary literature on cognitive styles and learning (Sense, 2007). Social loafing refers to the notion that when outputs are combined, individual contributions cannot be isolated. Under these conditions participants could individually receive neither credit nor blame for their individual performance so they loaf. Harkins and Szymanski (1989), mention many examples of loafing experiments such as when participants have been asked to react to persuasive messages, to evaluate proposals, to negotiate as many uses as possible for an object, or to pull on a rope as a group. These ideas on social loafing are also related to group motivation. Kerr (1983) explains how when groups loaf, some group members would reduce their efforts if they had a capable partner who free rode on their efforts (that is who was capable of contributing to the group but would not).

The TBL and the related contemporary concepts have commonalities with these psychological constructs in the sense that the focus is on group performance and effort. Due to this similarity, free riding could/would also occur in TBL. Despite this potential problem, however, Sense's (2007) work on cognitive styles suggests that individual learning may still occur in a fairly heterogeneous group such as the one in which some members are free riding. Cognitive styles "represent stable intrapersonal traits across situations, across tasks and across cognitive abilities that learners employ in perceiving and processing information and stimuli while interacting and learning within an environment" (Sense, 2007:33). In Sense's study it was shown that over the longer term, having a mismatch of cognitive styles in a team can prove necessary for further improving participants' learning development. Learning

may therefore improve in the long run in a TBL context, despite the presence of members with different cognitive styles, such as free riders and those who do more or less work. In fact, there is recent evidence in the Educational Psychology literature suggesting that interactions among group members change predictably over time, improve and develop (Sweet & Michaelsen, 2007). Furthermore, a way of ensuring that the unequal work effort is reduced or eliminated is through effective peer assessment, as reported in Bastick's (1999) study.

Feedback on student performance is likewise known to be important to student learning. Learning is given focus by students' metacognitive understanding of what they know and what they do not know, and feedback is central to creating this understanding (Chickering & Gamson, 1987). Empirical studies have shown improvements in learning through the provision of feedback on student performance (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; M. Epstein et al., 2002; Higgins, Hartley, & Skelton, 2002), and this literature emphasizes that feedback must be prompt and constructive (Fink, 2003; Wiggins, 1998)" (Cotner, Fall, Wick, Walker, & Baepler, 2008:438).

Dihoff, Brosvic and Epstein (2003), compared a number of different testing and feedback formats on undergraduate students including, no feedback (word-processed answer sheet, scantron form), delayed feedback (end of test, 24 hours) and immediate feedback while answering each test item. Students demonstrated the highest recall, the most accurate identification of initial responses, the most confidence in their answers, and the least amount of continual incorrect responding on those final examination items that were originally responded to when immediate feedback was provided. They found that students were transformed from the role of passive gatherer of information to an active demonstrator of skills and knowledge. That the immediate feedback response format with the opportunity to answer-until-correct promoted greater retention, increased confidence and the greatest accuracy at identifying initial responses (correct and incorrect) than when the immediate feedback was not used. It is the process of requiring the student to review the question and consider why the initial response was incorrect, review the remaining options, discriminate between the answers remaining and continue to respond until the correct answer is discovered. "The active nature of this process is analogous to a level-of-processing task, and it is likely that the variety of activities during encoding promotes the correction of initially inaccurate strategies" (Dihoff, et al., 2003:546). This outcome suggests that the use of immediate feedback helps with the selection of correct responses during future assessment situations.

Light (2001:8) highlighted the importance of instant feedback for student learning. With evidence from the Harvard Assessment Project, Light found that "a large majority of students say they learn significantly more in courses that are highly structured, with relatively many quizzes and short assignments. Crucial to this preference is getting quick feedback from professors – ideally with an opportunity to revise and make changes before receiving a final grade. In contrast, students are frustrated and disappointed with classes that require only a final paper. How can we ever improve our work, they ask, when the only feedback comes after a course is over, and when no revision is invited?"

Above all, effective feedback should improve learning quality and learning outcomes in student teams (Trigwell & Prosser, 1991). Michaelsen and Schultheiss (1988) however, warn that not all feedback is positive. If the intent is to establish who is in charge or condemn the student, the outcome is likely to be negative and the feedback should not be given in those situations. On the contrary, the authors suggest that there are seven elements of constructive, helpful feedback. Helpful feedback is:

- 1) descriptive, not evaluative (avoids the use of words like wrong or bad as they will likely cause a defensive reaction);
- 2) specific (the more specific the feedback the more information it contains);
- 3) honest and sincere;
- 4) expressed in terms relevant to the receiver's needs;
- 5) timely (in general, the more immediate the feedback, the more helpful it will be);
- 6) desired by the receiver (not imposed on him or her); and
- 7) usable (concerned with behaviour over which the receiver has control).

One example of assessment that meets these criteria is the Immediate Feedback Assessment Technique (IF-AT). The IF-AT has several benefits, it keeps students engaged in class, it can encourage student-student interaction and it provides students with immediate feedback on their understanding on the topic being tested. These are important functions of ensuring student success (Pascarella & Terenzini, 1991).

The IF-AT uses a multiple-choice answer form covering the answer options. Instead of using a pencil to fill in a circle, each student scratches off their answer as if scratching a lottery ticket. The student scratches off the

coating of the rectangle corresponding with their first-choice answer. If the answer is correct, a star or other symbol appears somewhere within the rectangle indicating they have found the correct answer. If incorrect, the student must re-read the question and remaining answer options and scratch off a second or even third choice until the correct answer is identified. The student's learning is immediately reinforced, and moves on to the next question. The IF-AT thus transforms traditional multiple-choice testing into an interactive learning opportunity for students (Epstein, 2008).

When used in groups, the IF-AT is particularly effective as a means for encouraging not only individual engagement but also student-student interaction and peer instruction, teaching techniques that have been shown by several decades of research to be excellent for encouraging active processing of course material and hence for enhancing student learning (Crouch & Mazur, 2001; Michaelsen, et al., 2004; Slavin, 1991). Cotner and colleagues (2008) also found that students enjoyed the use of IF-AT and appreciated the opportunity for group interaction and that they valued the immediate feedback provided by the IF-AT because it revealed misconceptions and helped them to improve their exam preparation. "The pedagogical potential of instant feedback methods lies in three functions of the techniques: fostering student engagement; encouraging student-student interaction; and providing immediate feedback on student understanding" (Cotner, et al., 2008:441).

With the IF-AT assessment system students are provided with immediate feedback about the accuracy of their answers, ensuring timeliness and specificity. The system also allows students to continue answering a question until they discover the correct answer. This ensures that students' last response is the correct one and it enables the IF-AT to teach the students while it assesses them, facilitating their learning and improving retention of the information required. The feedback is therefore expressed in terms relevant to the receiver's needs, not imposed on him/her and usable by the receiver, ensuring further congruence with Michaelsen and Schultheiss's (1988) helpful feedback criteria.

Whetten (2007) suggests the following questions when setting the learning objectives for course design:

- What are the three or four most important things I hope students will master during this course?
- What do students in this course need to learn to prepare them for subsequent courses?
- What would I like my students to be doing consistently 5 years from now?
- How can I engender a love of this subject matter that will foster my students' commitment to lifelong learning?
- Assuming that students will master the content of this course, how might they use this information to accomplish something important in an organizational setting?

These can be achieved through careful planning and implementation of group work within the course helping students to achieve each of these outcomes with a deeper level of understanding when they are required to apply what they are learning through an activity that involves a team approach. It is through meaningful application that lasting comprehension takes place (Whetten, 2007).

Assessment

Other assessment methods and approaches have also been investigated in higher education literature relevant to the topic of TBL (Ballantine & McCourt Larres, 2007b; Birenbaum, 1997; Clinton & Kohlmeyer, 2005; Dyball, Reid, Ross, & Schoch, 2007; Jackling, 2005; Moscardo, 2008; Scouller, 1998). There appears to be a lack of TBL literature, however, on assessment methods and approaches of Management students.

Birenbaum (1997) investigated inter-and intra-group differences in assessment preferences among students in the disciplines of Engineering and Education. Similarly, Scouller (1998) focused on second year students in Education and examined their assessment preferences and learning approaches through a self-administered questionnaire. More recently, there has been TBL literature focusing on assessment approaches used in the Accounting discipline (Ballantine & McCourt Larres, 2007b; Clinton & Kohlmeyer, 2005; Dyball, et al., 2007; Jackling, 2005). For example, Clinton and Kohlmeyer (2005) investigated the effect of group quizzes on accounting students' performance and motivation to learn. Two experiments were conducted to compare the performance and motivation to learn differences in students who engaged in group quizzes versus those who did not do group quizzes. It was found that there were no performance differences between the groups. However, students in the first experiment (using group quizzes) reported a significantly greater motivation to learn than those in the second experiment (not using group quizzes). While Dyball and colleagues (2005) found that assessed group work was a positive experience for their accounting students and a vehicle to develop transferable skills, such as teamwork, self-management, planning and organising. In the Tourism field, Moscardo (2008) recently reported on the development,

implementation and evaluation of an innovative teaching approach that offered students an option to design their own assessment schedule as part of problem based group work.

Debnath, Tandon and Binter (2007) through their extensive review of the literature on educational effectiveness note that student motivation and continued attention is more likely to occur if there is feedback specifically directed at improvements to performance in future assessments. The use of the IF-AT technique allows for this feedback to be instantaneous therefore allowing for improvements to study methods for future assessment pieces.

The use of innovative approaches to teaching can also bring with it challenges for staff. These challenges can include students choosing not to engage in the process or opportunities that are provided (Cornelius & Gordon, 2008). Staff having higher workloads (S. Kunkel, 2002; Moscardo, 2008) and facing resistance or hostility from other staff members for using unconventional approaches (Snyder, 2003). Kunkel (2002) also mentions that some innovative techniques used may not involve assessment that is compatible with administrative requirements. However, despite these challenges many authors still remain supportive of the introduction and use of new innovative methods into higher education (Moscardo, 2008).

This article extends some of these ideas and explores a TBL-related assessment approach with a group of Management students to fill the literature gap. Specifically, the paper aims to further contribute to the growing literature on TBL in higher education and employs the highly useful IF-AT technique in a study with a group of undergraduate university students in a Strategic Human Resource Management class at an Australian university.

Framework for using the IF-AT technique

The present paper reports on a case study of the introduction of an innovative teaching technique used in my second year undergraduate human resource management class. The approach used includes an innovation called the Immediate Feedback Assessment Technique also known as the IF-AT. This approach was originally developed by Michael Epstein, a psychology professor, who developed the IF-AT testing system to revolutionise the traditional multiple choice questionnaire into one that is interactive for students and a more informative assessment opportunity for teachers. Epstein states that the use of the IF-AT testing system enables students to be provided with immediate feedback about the accuracy of their answers to each question in a test. The IF-AT system provides immediate affirmative feedback (if a student's answer choice is correct) and/or corrective feedback (if a student's answer choice is incorrect). The IF-AT uses a multiple-choice answer form with a thin opaque film covering the answer options. Instead of using a pencil to fill in a circle, each student scratches off their answer as if scratching a lottery ticket. The student scratches off the coating of the rectangle corresponding with their first-choice answer. If the answer is correct, a star or other symbol appears somewhere within the rectangle indicating they found the correct answer. The student's learning is immediately reinforced, the student receives full credit for the answer, and moves on to the next question. If incorrect, the student must re-read the question and remaining answer options and scratch off a second or even third choice until the correct answer is identified. The student will earn partial credit for multiple attempts and learn the correct response for each question while taking the test. One of the keys to the IF-AT system is that students never leave a question without knowing the correct answer.

This approach was then further developed by Professor Larry Michaelsen who used the approach to help with Team Based Learning (TBL). As classes become larger, more diverse and face-to-face time more limited, the need for active learning becomes stronger. TBL increases individual and group engagement in class and encourages students to take responsibility for their own learning. Small group work can produce a variety of beneficial educational outcomes. However, these outcomes, can only occur when instructors produce conditions that motivate students to prepare and engage in give-and-take discussions. Michaelsen (1998) suggests applying three fundamental principles to create these conditions in learning groups. These principles include: "1) promoting individual and group accountability, 2) using assignments that link and mutually reinforce individual work, group work and total class discussions and 3) adopting practices that stimulate give-and-take interaction within and between groups. Further, to obtain the best results from using small groups, instructors must observe these key principles in managing each of three opportunities (shown as 3 boxes in Figure 1) to engage students with course concepts: individual work, small group work and total class discussion" (Michaelsen, 1998:1). Insert Figure 1 about here

Promoting Ongoing Accountability

If students fail to prepare for group work, group assignments are likely to force better students to 'carry' their less willing and/or less able peers. Further, improperly managed small-group discussions are likely to

degenerate into social events in which little if any learning occurs. However, these problems can be avoided almost entirely by using assignments and practices that hold individuals and groups accountable for their behaviour.

Individual accountability – Instructors can use three quite different mechanisms to promote responsible individual behaviour. The most basic mechanism is requiring students to complete preparatory individual assignments (especially graded ones) prior to group discussion (eg requiring students to turn in written concept summaries at the beginning of class on group assignment days). A second mechanism is using procedures or assignments that cause members to express their point of view during group discussions. (eg. some instructors assign one member to make sure that everyone is asked to provide input). The third mechanism is to include peer evaluation in the grading system.

One very effective way to promote individual accountability is the Readiness Assurance Process in Team Learning (Michaelsen, Knight & Fink, 2004). This process requires individuals to complete a test (typically true-false/multiple-choice) over a set of pre-assigned readings and turn in their answers. Next, groups re-take the same test and turn in their consensus answers for immediate scoring. This process incorporates all three mechanisms for promoting individual accountability. First, students are directly accountable because the individual scores count as part of the course grade. Second, during the group test, each member is invariably asked to voice and defend his or her choice on every question. The resulting discussions produce immediate feedback that provides clear evidence of both the degree to which individual members have prepared, in advance, for the group work and the importance of obtaining input from everyone on all important decisions. Third, members who fail to complete the assigned readings almost invariably receive a low peer evaluation (Michaelsen, Knight & Fink, 2004). In order to improve learning quality and learning outcomes in student teams (Trigwell & Prosser, 1991), effective feedback should be implemented. Michaelsen and Schultheiss (1988), however, warn that not all feedback is positive. If the intent is to establish who is in charge or condemn the student, the outcome is likely to be negative and the feedback should not be given in those situations. On the contrary, the authors suggest that there are seven elements of constructive, helpful feedback. These are that helpful feedback is:

- 1) descriptive, not evaluative (avoids the use of words like wrong or bad as they will likely cause a defensive reaction);
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- 5) timely (in general, the more immediate the feedback, the more helpful it will be);
- 6) desired by the receiver (not imposed on him or her); and
- 7) usable (concerned with behaviour over which the receiver has control).

The present case was conducted within the context of a second year Strategic Human Resource Management class that was part of a Bachelor of Business degree at a regional Australian university. The IF-AT was used as one part of the assessment for the subject and was designed around Michaelsen's (1998) TBL concept. Students had to complete an individual multiple choice test and then had to take the same test in groups (Whetten, 2007) using the IF-AT. The class received an information session explaining the technique to be used and detailed assessment criteria were also provided. The following table provides a summary of key features for curriculum design that were included in the course. Insert Table 1 about here

Method

The analysis of the case study used a range of methods in accordance with the principles for case study analysis provided by Miles and Huberman (1994) and Yin (1994). These methods included analysis of archival material collected from the year that the innovation was implemented and the previous year that the class was offered, allowing for comparison between the two. Three student surveys were available for analysis. The first was a web-based survey used at the case study institution to gather feedback about the class overall. This was called '*Student Feedback about the Subject (SFS)*'. The second survey was a more detailed self completion questionnaire administered by administration staff to gather information specifically about the teacher. This was called the '*Student Feedback about the Teacher (SFT)*'. Finally, a survey was developed that specifically evaluated students' responses to the teaching innovation used in class. The survey received ethics approval and was completed anonymously by students. Students were not identified in order to minimize any concerns they might have about their feedback impacting on their grades. Details of the questions asked in the survey will be provided in the following results tables.

A total of 56 students participated in the class made up of 40 females and 16 males. Of the students nine registered as international students, with 1 from Mexico, 1 from Norway, 1 from Japan, 1 from the Solomon Islands, 1 from Sweden and 4 from Papua New Guinea. Just over one third (32.1%) of the students were either 19 or 20 years old, while 53.6% were aged 21-29 years old and 10.7% were aged 30+.

RESULTS AND DISCUSSION

Archival Analysis

The first part of the data available for analysis was the archival records kept as part of the class administration. For this case study these included attendance at both the individual tests and the group tests, individual and group grades for each of the four tests and a comparison of the final grades against the previous year. Please see Table 2 for a summary of the archival analyses. Attendance for the classes was extremely high with two tests having 100% attendance, five tests having 98% and one test having 96% attendance. This level of attendance is high, compared to attendance reported by my colleagues in other classes. This level of attendance is most likely the result of several features – having the tests as part of the summative assessment for the course, incorporating TBL which increases individual and group engagement in class and encourages students to take responsibility for their own learning and promoting ongoing accountability including both individual and group accountability.

The individual grade for each test compared with the group grade for each test revealed that students received better grades on the group test than on the individual one. Each student was given a multiple choice quiz to take individually, they then formed together in their groups to retake the same test using the IF-AT. When used in groups, the IF-AT is particularly effective as a means for encouraging not only individual engagement but also student-student interaction and peer instruction, teaching techniques that have been shown by several decades of research to be excellent for encouraging active processing of course material and hence for enhancing student learning (Slavin, 1991; Crouch and Mazur, 2001; Michaelson et al, 2004). The results demonstrated that students were able to engage and improved learning via the social interaction in the group activity. This was further evidenced by the pass/fail rate of the subject with the fail rate at 5.3% before the IF-AT was introduced and it dropping to 1.8% after the IF-AT was introduced were sustained learning is provided. Incorporating team work into classes can be problematic due to uneven effort of group members, getting everyone to participate and making sure everyone is actually contributing in the team (Gueldenzoph & May, 2002). Many students have negative perceptions of group work due to experiences of working in dysfunctional groups, social loafing or free riding. The opposite was evidenced here where I observed total engagement amongst the students whilst completing the IF-AT. A peer review of my teaching was also conducted and provides further evidence.

“While I [peer reviewer] observed deep discussion about the correct answers, more importantly there was deep discussion when a group scored an incorrect answer and the incorrect answer was often the result of less consultation encouraging the students to have deeper discussions. From my observation of the class ALL students became deeply engaged with the process and I was unable to observe any member of any group who was not contributing; a rare event in student group work. During the process I observed true Team Based Learning occurring; group members took the time to explain to other members why a particular answer was wrong and together they discussed how another answer may be correct, I saw learning occurring with very little intervention from the lecturer”

Even though there are these negative perceptions of group work, employers still state that a key learning objective of graduates be that they are able to work in a team or group environment as that is what is mirrored in the work force. Due to this feedback from employers and an overall need to produce graduates that are capable of working in a team environment we have seen group projects become an important component of higher education (Friedman, et al., 2008).

Overall with the final grade distribution, a slight increase in each of the grade categories was seen except for the HD and D categories. The general increase in the grade distribution could be linked to the process of TBL and using the IF-AT over a period of time where students increase their awareness and ability to discuss test questions for longer and in more depth (Sweet & Michaelsen, 2007) and therefore can make better decisions as opposed to having one person dominate other members of the group, which can happen in other group work. This would need further investigation though as the findings are not from a sample large enough to generalise. Insert Table 2 about here

Student Surveys

The second source of data included three student surveys. Table 3 provides a comparison of student ratings of the quality of class for those that completed the subject in the previous year when the IF-AT was not used (traditional methods were used to teach the content) and those that completed the subject which did include the IF-AT. This was a voluntary self completed online survey. As access is not provided to the raw data, it was not possible to conduct any statistical tests for differences between the years. Overall, all of the students' evaluations for the class increased when the IF-AT was introduced except for two of the rating scales. Insert Table 3 about here

The second type of survey used was administered by the institution, with more detailed evaluations of teaching practice. Table 4 represents the findings once again from the class before the IF-AT was introduced with that of the class that did experience the IF-AT. Insert Table 4 about here

As can be seen, the student evaluations were very positive, with the majority of students rating each item as either more than acceptable or outstanding. Nearly all of the rating scales increased except for two that remained the same and two that had a slight decrease. Information available from the institution indicates that the average scores across the university were slightly above the mid range of acceptable, suggesting that the evaluations for this class are high.

The final survey was one focused on the specific features of the new curriculum. This survey was completed by 41 students. See Table 5 for a summary of the responses. The first question from this survey asked students to list the three best things about the class overall. The most common response was "the assessment approach" with 33 students stating this as being the best feature of the class overall. Other common themes that emerged included,

- Positive comments about teaching staff for the class
- The interesting subject content
- Positive comments about the subject overall
- Helped students to think about their career/degree/future
- Positive effect on individual (eg. less stressful, developed skills) Insert Table 5 about here

The second question asked students to consider more specifically the IF-AT assessment approach and to list the three best things about this particular aspect of the class. Key themes to these answers included the following:

- Positive comments about working in a group
- Immediate feedback
- Fun/enjoyable/interesting
- Positive comments about marking/point system
- Ease of use
- Improve grades
- Relaxed/less stressful
- Material was easier to comprehend/learn

The third question sought suggestions on any changes to the IF-AT. The most common answer was nothing. The second most common answer included comments on the physical set up of the groups which were out of the students' control, for example, the room space that the lectures were held in, how they were assigned groups and being provided more time to do the IF-AT. Interestingly, the next most common answer was to change the assessment back to what had been done in the previous year. This is interesting as the next question on the survey asked students to pick one of three options that they would prefer. 'return to two individual multiple choice mid semester tests and a case study presentation and a final exam'(3 responses), 'keep the IF-AT technique with the individual and group multiple choice tests throughout the semester without any changes' (26 responses) and 'keep the IF-AT technique but change/improve it' (9 responses). This question was used as a check against what changes students suggested. The overwhelming majority wanted to see the IF-AT remain part of the assessment with some opting for changes or improvements, only three students wanted to see a return to the former assessment approach.

CONCLUSIONS

The evaluation of the IF-AT has provided substantial support for the use of this innovative teaching technique. The student ratings across all three student surveys were positive. The approach also seemed to be associated with a higher student engagement rate as evidenced by myself, my peer review of teaching and a slightly

higher performance in terms of grades. Even though the study did not show that overall student performance (final grades) significantly differed between a more traditional teaching approach and team based learning teaching approach, the fact that the overall average did not drop and that more students completed the course makes using the IF-AT in TBL worth considering.

Student comments on the IF-AT were in general very positive and complementary they felt they learned more content but also learned how interpersonal group dynamics work and how to manage these. Many of the student responses are also consistent with recommendations offered in the literature. In particular students commented on their individual accountability (Michaelsen, 1998; Michaelsen, et al., 2004), being accountable to a group (Michaelsen, 1998; Sweet & Michaelsen, 2007), removing barriers to participation (Cotner, et al., 2008; Michaelsen, et al., 1996; Sweet & Michaelsen, 2007) and providing immediate feedback in order to help with learning (Dihoff, et al., 2003; Dihoff, Brosvic, Epstein, & Cook, 2004; Epstein, 2008; M. Epstein, et al., 2002). These were further evidenced by comments made by students about the IF-AT.

“The best thing was your marks were known immediately, it was different and entertaining”
“It encouraged a ‘fun’ atmosphere with group interaction”
“Better understanding of concepts”
“Should be used in every subject”
“Opportunity to discuss answers so when it’s wrong there is a chance you now understand why”
“I wanted to provide you with some feedback following our ‘group test’ on Friday. It was a really fun way to do a test - not the same pressure as a test usually presents. Also, students often sit around and dissect a test afterwards anyway, this group test was almost like a debrief. The great thing was you knew immediately, how well you had gone. Provided instantaneous feedback. Great innovation - I loved it.”

The recommendations that curriculum and teaching methods be modified to enhance students’ skills in the areas of communication, cognitive and interpersonal skills through the use of teams or groups of students (J. Kunkel & Shafer, 1997; Siciliano, 2001) can be achieved through the use of TBL and the incorporation of the IF-AT as evidenced here in this case study. It is the pedagogical potential of instant feedback that can help to foster student engagement, encourage interaction between students and provide immediate feedback on student understanding (Cotner, et al., 2008).

Figure 1: Engaging Students with Course Concepts (Michaelsen, 1998)

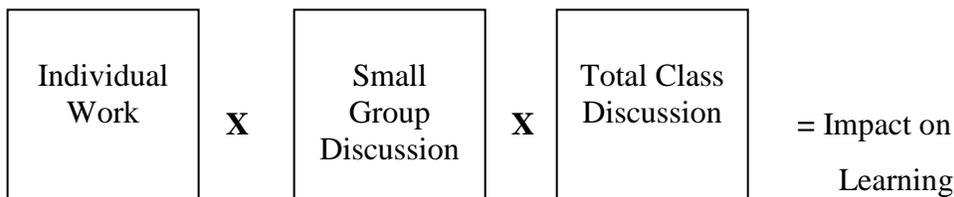


Table 1: Summary of Key Features of the Case Study Curriculum Design

<i>Curriculum Feature</i>	<i>Recommendation from literature</i>	<i>Reference for the recommendation</i>
Individual accountability	Promote responsible individual behaviour	(Michaelsen, 1998; Michaelsen, et al., 2004)
Group accountability	Carefully manage small group and total class discussions	(Michaelsen, 1998; Sweet & Michaelsen, 2007)
Adopting practices that stimulate idea exchange	Create conditions that foster give and take group interaction	(Michaelsen, 1998; Sweet & Michaelsen, 2007)
Remove barriers to participation	Use permanent groups and assignments, practices, and a grading system that foster the development of group cohesion	(Cotner, et al., 2008; Michaelsen, et al., 1996; Sweet & Michaelsen, 2007)
Provide immediate feedback	Immediate feedback is beneficial for learning (and is superior to delayed feedback)	(Dihoff, et al., 2003; Dihoff, et al., 2004; Epstein, 2008; M. Epstein, et al., 2002)

Table 2: Summary of Archival Analyses

<i>Archival Source</i>	<i>Content categories</i>	<i>Distribution of measures</i>																																													
Session Attendance for individual and group tests	Individual Test 1 Group Test 1 Individual Test 2 Group Test 2 Individual Test 3 Group Test 3 Individual Test 4 Group Test 4	Number of students attending (n=56) 56 55 55 55 56 55 55 54																																													
Individual Grade vs Group Grade for Tests 1-4	Individual Test 1 Group Test 1 Individual Test 2 Group Test 2 Individual Test 3 Group Test 3 Individual Test 4 Group Test 4	<table border="1"> <thead> <tr> <th>HD</th> <th>D</th> <th>C</th> <th>P</th> <th>N</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>9</td> <td>9</td> <td>31</td> <td>7</td> </tr> <tr> <td>40</td> <td>15</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>12</td> <td>17</td> <td>18</td> <td>8</td> </tr> <tr> <td>42</td> <td>13</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>0</td> <td>5</td> <td>6</td> <td>25</td> <td>20</td> </tr> <tr> <td>16</td> <td>28</td> <td>5</td> <td>6</td> <td>1</td> </tr> <tr> <td>0</td> <td>7</td> <td>4</td> <td>23</td> <td>22</td> </tr> <tr> <td>28</td> <td>20</td> <td>5</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	HD	D	C	P	N	0	9	9	31	7	40	15	0	0	1	1	12	17	18	8	42	13	1	0	1	0	5	6	25	20	16	28	5	6	1	0	7	4	23	22	28	20	5	1	1
HD	D	C	P	N																																											
0	9	9	31	7																																											
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16	28	5	6	1																																											
0	7	4	23	22																																											
28	20	5	1	1																																											
Final Grade	Average grade of class before the innovation HD D C P N Actual grade for the class HD D C P N	1 (2.6%) 8 (21.0%) 15 (39.5%) 12 (31.6%) 2 (5.3%) 0 9 (16.1%) 25 (44.6%) 21 (37.5%) 1 (1.8%)																																													

Table 3: Student Evaluations (SFS) Pre and Post IF-AT

<i>Rating Scale</i>	<i>Mean rating pre IF-AT</i>	<i>Mean rating post IF-AT</i>
The teaching staff of this subject motivated me to do my best work	4	3.92
The teaching staff worked hard to make this subject interesting	3.75	4.31
My lecturers were extremely good at explaining things	4	4.15
The staff made a real effort to understand difficulties I might be having with my work	3.5	4.08
The staff put a lot of time into commenting on my work	3.5	4.08
The teaching staff normally gave me helpful feedback on how I was going	3.5	4.23
The staff made it clear right from the start what they expected from students	4.25	4.23
The assessment requirements and criteria were clearly specified	4	4.46
The teaching and learning experiences of this subject were well organised	4.25	4.15
This subject helped me develop my ability to work as a team member	4	4.38
This subject sharpened my analytical skills	3.75	3.92
This subject developed my problem solving skills	3.5	3.85
This subject improved my skills in written communication	3.5	4
As a result of this subject, I feel more confident about tackling unfamiliar problems	3.5	3.92
This subject helped me to develop the ability to plan my own work	3.5	3.85
Overall, I am satisfied with the quality of this subject	4	4.25

1 = Strongly Disagree, 2 = Disagree, 3 = Neither Disagree or Agree, 4 = Agree, 5 = Strongly Agree

Table 4: Student Evaluations of Teaching (SFT) Practice Pre and Post IF-AT

<i>Rating scale</i>	<i>Mean rating pre IF-AT</i>	<i>Mean rating post IF-AT</i>
The quality of this teacher's explanations	3.88	3.9
This teacher's interest in assisting students to learn	3.76	4.06
The structure of this teacher's presentations	3.76	4
This teacher's accomplishment of the aims of the subject	3.71	3.78
The information about assessment requirements provided by this teacher	3.94	4.06
This teacher's understanding of the subject	4.06	4.78
The level of feedback provided by this teacher	3.65	3.66
This teacher's effort to motivate students	3.53	3.76
The level of interest generated by this teacher	3.76	3.86
How this teacher clarified the subject's expectations of students	3.65	3.88
This teacher's organisation	4.12	4.12
This teacher's use of teaching aids	3.94	3.94
This teacher's punctuality	4.53	4.33
This teacher's availability to students	4.12	3.94
This teacher's use of email and the world wide web	4	4.24
Overall, the quality of this staff member's teaching	3.88	4.16

Rating scale is from 1 (completely unacceptable) to 5 (outstanding).

Table 5: Summary of Final Survey Answers

<i>Questions and main themes in responses</i>	<i>N</i>
Three best features of the class overall	
o The assessment approach	33
o Positive comments about teaching staff for the class	22
o The interesting subject content	29
o Positive comments about the subject overall	10
o Helped students to think about their career/degree/future	3
o Positive effect on individual (eg. less stressful, developed skills)	6
Three best features of the assessment approach	
o Positive comments about working in a group	30
o Immediate feedback	29
o Fun/enjoyable/interesting	14
o Positive comments about marking/point system	7
o Ease of use	2
o Improve grades	1
o Relaxed/less stressful	2
o Material was easier to comprehend/ learn	4
Suggested changes to the assessment approach	
o Nothing	24
o The physical set up of the groups (eg. room space, input into groups, more time to do the group test)	
o Less multiple choice questions	13
o More multiple choice questions	4
o Change class back to previous assessment (one mid semester test and one end of semester test)	1
o Comments about changing oneself (eg. change the way I study, go to more lectures, etc)	
o Negative comments about the IF-AT	12
	3
	4

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