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CULTIVATING ICT STUDENTS' INTERPERSONAL SOFT SKILLS IN ONLINE LEARNING ENVIRONMENTS USING TRADITIONAL ACTIVE LEARNING TECHNIQUES

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Abstract

Flexible online delivery of tertiary ICT programs is experiencing rapid growth. Creating an online environment that develops team building and interpersonal skills is difficult due to factors such as student isolation and the individual-centric model of online learning that encourages discrete study rather than teamwork. Incorporating teamwork 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. Despite this, employers still state that a key learning objective of ICT graduates is the ability to work in team environments as this mirrors work force requirements. This paper presents a discussion of preliminary findings from a pilot study to determine best practices for developing interpersonal skills for students while working in virtual groups using synchronous and asynchronous online technologies.

Keywords

POGIL, IF-AT, research-based education, active learning, online learning environment, team-based learning

Introduction

"Soft skills" refer to interaction, articulation and interpersonal skills in the *Information Communication Technology* (ICT) discipline and are extremely important for ICT professionals and in the development of quality ICT graduates. Soft skills increase the employability of graduates who can demonstrate effective communication skills with clients and colleagues (McMurtrey, Downey, Zeltmann, & Friedman, 2008). Some researchers contend that these skills are often overlooked within the tertiary level curriculum, particularly with the recent shift towards online delivery (Ahmed, Capretz, Bouktif, & Campbell, 2012; Chan, 2011).

Flexible online delivery of tertiary ICT programs is experiencing rapid growth. Aligned with this is the need to create an Online Learning Environment (OLE) that engages students and develops team building and interpersonal skills. One of the difficulties in creating effective OLEs is student isolation, which is said to invoke an individual-centric model of learning that encourages discrete study rather than teamwork (Haythornthwaite, Kazmer, Robins, & Shoemaker, 2000; Morgan & Tam, 1999). Despite this, employers still insist that a key learning objective of ICT graduates is the ability to work in team environments as this mirrors work force requirements (Ahmed et al., 2012; Australian Workforce and Productivity Agency, 2013). Due to this need, group exercises and projects have become an important component of higher education (Blackman, 2012; Friedman, Cox, & Maher, 2008; Myers, Monypenny, & Trevathan, 2012).

To address these aspects of learning, this study sought to determine which existing traditional teaching methodologies and tools are most effective in fostering interpersonal skills and desired graduate traits through enhanced student learning experiences in a virtual learning environment. Two identified *Team-Based Learning* (TBL) techniques that develop soft-skills in traditional face-to-face teaching environments (see Figure 1) include: *Process Oriented Guided Inquiry Learning* (POGIL) and the *Immediate Feedback Assessment Technique* (IF-AT). These active learning methodologies can foster interaction, team building and learning through highly structured group work in both face to face and online modes. The key to these interactive group work techniques is that students are accountable to their peers. Accountability is a major factor in a professional environment and we aim to replicate this in an online environment.

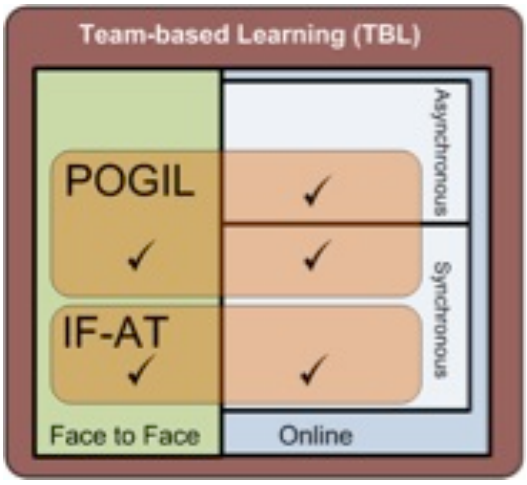

Figure 1. Conceptual map of the project scope

This paper introduces a project that sought to integrate these effective face-to-face methods into the online environment to increase student engagement and participation and enhance the learning experience. This was implemented using two traditional in-class TBL methods in *synchronous* (concurrent) and *asynchronous* (non-concurrent) online group environments. Preliminary findings

from this undertaking are reported here with a view to inform a framework of best practices for the development of interpersonal skills for students working in virtual groups on completion of the project. The framework will include recommendations and working models for use in currently available collaborative tools including assessment design to foster collaboration. This paper outlines the overall project, which was funded by the Australian Council of Deans of ICT (ACDICT) Learning and Teaching Academy (ALTA), and presents preliminary results from three different online group work implementations.

This paper is structured as follows. The background of group-based teaching methodologies is presented, followed by a description of the methodology and implementation of the study elements. Following a discussion of preliminary results, the paper concludes with a brief summary and implications of the project outcomes.

Background

Traditional face-to-face Team-Based Learning (TBL) and active learning teaching methodologies

To be "work-force ready" directly from university, an ICT graduate should possess effective soft skills namely, interpersonal and communication skills. There are two significant challenges that face teaching staff in ICT online learning environments: (1) invoking and maintaining student engagement to ensure comprehension and positive learning outcomes; and (2) the development and progressive growth of "soft skills" throughout their degrees. Due to the need for soft skills, team exercises and projects have become an important component of higher education (Blackman, 2012; Friedman et al., 2008; Myers et al., 2012).

Both student engagement and the development of communication skills can be accomplished through the collaborative and cooperation structure found in *Team-Based Learning* (TBL) teaching methodologies (Michaelsen, Sweet, & Parmelee, 2011; Pulko & Parikh, 2003). Team building implementations need to take place at four points in time: (1) before class begins; (2) during the first day of class; (3) during each major unit of instruction; and, (4) near the end of the course (Michaelsen, 1998). Michaelsen (1998)_ENREF_23 identified four key principles that govern the effective use of learning teams during these four points in time:

- Groups must be properly formed and managed;
- Students must be made accountable for their individual and group work;
- Group assignments must promote both learning and team development; and,
- Students must have frequent and timely feedback.

The use of technology can be beneficial to learning in groups and teams (Carnaghan & Webb, 2007; Clark & Gibb, 2006; Dineen, 2005; Hutchinson, 2007; Shrivastava, 1999; Williams, Duray, & Venkateshwar, 2006). In 1999, Shrivastava introduced the concepts of online learning communities to understand

how university education can be organised to incorporate emerging digital and broadcasting technologies for classroom instruction and distance learning. The use of OLEs has evolved and flourished since 1999, particularly in the context of cooperative learning or TBL. For example, Hutchinson (2007) examined how cooperative learning can be combined with OLE factors (such as students' e-learning approaches). Hutchinson 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. *TeamXchange* is an online team-based virtual exercise implementation for undergraduates developed by Dineen (2005), which was found to enhance student learning and engagement through collaboration in virtual teams.

Immediate Feedback Assessment Technique (IF-AT)

Feedback on student performance is important to student learning (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; M. Epstein et al., 2002; Higgins, Hartley, & Skelton, 2002). Students' metacognitive understanding of what they know and what they do not know gives focus to learning and feedback is central to creating this understanding (Chickering & Gamson, 1987; Cotner, Fall, Wick, Walker, & Baepler, 2008).

Effective feedback should improve learning quality and learning outcomes in student teams and not be detrimental (Trigwell & Prosser, 1991). Michaelsen and Schultheiss (1988) warned that not all feedback is positive and 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. However, the authors suggested there are seven elements of constructive, helpful criticism where feedback should be:

1. *descriptive*, not evaluative (avoids 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 practice that meets these criteria is the *Immediate Feedback Assessment Technique* (IF-AT) (Blackman, 2012; Michaelsen, Knight, & Dee Fink, 2004). IF-AT uses a multiple-choice answer form covering the answer options (Michaelsen et al., 2004). Instead of using a pencil to fill in a circle, students scratch off their answers as if scratching a lottery ticket. If the first choice answer is correct, a star or other symbol appears indicating they have 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 with reduced marks for each wrong attempt. The student's understanding of each concept is immediately reinforced as they move on to the next question. The IF-AT thus transforms traditional multiple-choice testing into an interactive learning opportunity for students (Epstein Educational Enterprises, 2009). Students demonstrate the highest recall, the most accurate identification of initial responses, the most confidence in their answers, and the least amount of continual incorrect answers when immediate feedback is provided (Dihoff, Brosvic, & Epstein, 2003). Immediate feedback response formats combined with the opportunity to answer-until-correct promotes greater retention, increased confidence and the greatest accuracy at identifying initial responses (correct and incorrect).

When used in groups, the IF-AT is particularly effective for encouraging individual engagement, student-student interaction and peer instruction, which encourages active processing of course material and enhances student learning (Michaelsen et al., 2004). This approach is also associated with a higher student engagement rate and a higher performance in terms of grades (Blackman, 2012). The IF-AT method provides the group with immediate feedback on their understanding on the topic being tested (Pascarella & Terenzini, 1991).

Process-Oriented Guided Inquiry Learning (POGIL)

Process Oriented Guided Inquiry Learning (POGIL) is a student-centered pedagogical method devised from cooperative and collaborative learning techniques. POGIL teaches process skills (such as collaboration and written expression) as well as content using an inquiry-based approach (Moog & Spencer, 2008; Myers et al., 2012). Although POGIL employs student-centered techniques, it differs from other approaches in three ways:

1. There is an explicit emphasis on developing process skills;
2. POGIL activities are created for use by self-managed teams with highly structured roles; and
3. POGIL sessions guide students through an exploration to construct and refine comprehension of the content.

(POGIL, 2014)

The POGIL method lends itself to the analytical problem solving found in ICT and Computer Science (Myers et al., 2012; Trevathan & Myers, 2013; Trevathan, Myers, & Gray, 2014). POGIL is based on research indicating that:

- *Teaching by telling* does not work for most students;
- Students who are part of an interactive community are more likely to be successful; and
- • Students develop greater ownership over the material when they are given an opportunity to construct their own understanding (Moog & Spencer, 2008).

POGIL materials are designed for use with self-managed teams that interact with the instructor as a facilitator of learning rather than as a source of information.

Students work in small groups with structured individual roles to ensure that all group members are fully engaged in the learning process. Among others, the main roles include "Manager", "Recorder" or "Presenter", which are assigned in a face-to-face classroom implementation. The "Manager" ensures that all team members understand the concepts, the "Recorder" scribes the group's discussions while the "Presenter" delivers oral reports to the class using the Recorder's notes (Moog & Spencer, 2008). Importantly, each role is dependent on the other roles so students are accountable to their peers for the role they play. This group structure creates positive interdependence among the students, reinforcing involvement and learning for each student (Myers et al., 2012).

In a traditional classroom implementation, POGIL sessions are interwoven into the syllabus each week. The students work together on activities that are structured to help them build knowledge of a concept. The POGIL tasks include: *directed* questions, which can be answered from the information provided; *convergent* questions, which require groups to reach a consensus of the solution; or *divergent* questions, which can have a range of possible responses that could all be correct. The students are expected to reach a conclusion to each question on the activity and then communicate that answer in oral form via the "Presenter" (Myers et al., 2012).

Methodology and online implementation of the two TBL methods

This project was a pilot study to determine best practices for developing interpersonal skills for students while working in virtual groups using synchronous and asynchronous online technologies. Both POGIL and IFAT methods were integrated into the curriculum of three courses, that is, semester-long subjects or programs of study, at two universities to be referred to a University 1 and University 2. University 1 offered:

Course A	A first year business informatics course with face-to-face and online offerings. The online version is available via Open Universities Australia (OUA) with approximately 300 students; and,
Course B	A purely online third year ICT course with approximately 150 students. University 2 incorporated, and,
Course C	A second year management course that is available to ICT students with face-to-face and online offerings and has collectively approximately 130 students.

Having this degree of diversity allowed for both ICT and business informatics students to be assessed in this study using small and large groups across multiple modes of delivery (i.e., face-to-face, online synchronous and online asynchronous) (see Figure 1). It is important to note that:

- Course A used POGIL in synchronous time where the group work occurred concurrently.
- Course B applied POGIL methods with technologies that supported asynchronous group work. The students pooled their collective knowledge and

worked through POGIL tasks, which included directed, convergent and/or divergent questions.
- Course C applied IF-AT using synchronous technologies for concurrent group work. The IF-AT tasks were directed tasks and students had to reach a consensus so each student was accountable to others in their respective group.

These teaching methods were implemented using current collaborative and/or online teaching tools such as Blackboard's Collaborate, social networking, wikis and blogs. An assessment of experiences, techniques/methods used and student-learning outcomes such as *Approaches to Study Inventory* (ASI) (Epstein Educational Enterprises, 2009; Richardson, 1993) were used to determine the effectiveness of key graduate attributes, specifically: teamwork, communication skills, organisational skills, responsibility and accountability.

Web 2.0 tools, such as wikis, blogs and online collaborative forums, provide opportunities for students to engage with a variety of information systems without requiring in-depth technical literacy. These tools can be applied in synchronous and/or asynchronous OLEs because they are available to students as long as there is internet connectivity. This project explored the use of these technologies for developing students' soft skills.

Online POGIL implementation

Synchronous POGIL teamwork was implemented using Blackboard's Collaborate. Collaborate is an online learning and collaboration platform that includes a "whiteboard" space where all users could contribute, share files and screen/share programs for demonstration activities. Additionally, these tools offer "breakout session" functionality where students could separate from the main class into the smaller POGIL groups. The facilitator provided information on the lesson concepts and/or instructions depending on the learning outcome of the tutorial. The students assigned to a POGIL group and allocated to a "breakout room" where the problem was then discussed and the group would come to a consensus. During the breakout POGIL sessions, students typed text posts, questions and/or answers using *Instant Messaging* (IM) (chat) as they followed/contributed to the session. The POGIL roles were implemented in synchronous POGIL where the "presenter" reported their groups findings once back in the full class area.

Asynchronous POGIL teamwork was implemented via blogs and social media. Course B employed blogs and Facebook for both assignment work and discussion forums while Course A used Facebook for unassessed discussion forums about assignment tasks. Course B's group work assignment tasked the students to review various websites and team members were then required to comment on the review. The outcome of this assignment was a culmination of these debates and interactions. Although one student alone contributes to a blog, group work was accomplished by having other students in the course "comment" on blog posts as informal peer review. As opposed to wikis, which allow real-time contribution

and editing of web pages, a more robust history of the student's work is provided with a blog because the group's ability to "permanently delete" a post is limited.

Both Courses A and B created a course Facebook group to foster asynchronous discussion. Subgroups were created for POGIL teams to break out and discuss group-related concepts and ideas. The social networking site was constructive for developing learning communities where students experienced a "sense of community" in the OLE (Trevathan et al., 2014). These sites made use of functions to poll or survey the group and add documents, videos, and images for the group to share. The most current topic was always at the top of the list, which ensured that they were the seen "first" by the students. The moderators were instructed not to respond to student posts immediately to encourage students to support peer learning by answering or collaborating on an answer. Instead, the moderator could either confirm the collaborative response by "liking" the posts or adding a post that corrected or responded to the students' request.

Formality was an issue that arose from the choice of using an external social media platform (Facebook) as opposed to an internal platform embedded in the Blackboard educational content management system. There were instances when the formality and the educational purpose were lost and behavioural problems arose because Facebook is normally an environment that is informal and personal. In this trial, there were cases of bullying or abuse received by administrative staff if things went wrong or students were not happy with their marks. Explicit guidelines of acceptable behaviour for the use of the social media were necessary.

Online IF-AT implementation

The initial implementation of the online IF-AT web application was developed and used for group quizzes. Students were required to study for the individual quiz prior to re-sitting the same quiz as a group. The students felt obligated to study, as they were accountable to the group and so were better prepared for group work. On completion of the individual quiz, the students formed into allocated groups and moved into separate breakout rooms in Blackboard Collaborate

The IF-AT web application consisted of a login page, index page (listing available tests) and testing page to provide the quiz questions and provision for immediate feedback. The IF-AT web page was designed to have a recording mode as well as a view-only mode. An account for each mode was created for each group of students where one student from each group could log in with the recording credentials while the others login with the viewing credentials. The modal interface design is shown in Figures 2, 3 and 4 where the Recorder viewed the recording mode interface and the other team members were shown the view-only mode.

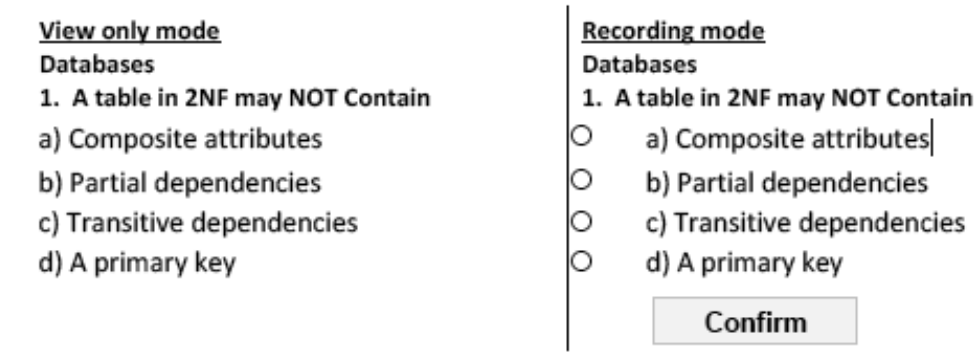

Figure 2. Example question in the IF-AT online implementation. The view-only mode interface is shown on the left and the recording mode interface is shown.

The Recorder chose the answer options for each question (Figure 2). Upon selecting an answer and clicking a "confirm" button, feedback would display immediately. An incorrect response would be highlighted in red and "incorrect" appended (Figure 3) whereas a correct response would be highlighted in green and "correct" appended (Figure 4). Students who were logged in as viewers, that is, the view-only option, would see the same feedback. In the case of an incorrect response, the Recorder could select another answer until "correct" or until only a single response remained. Notably, to discourage collusion between groups, the questions were shuffled into a different viewing order for each team. The students actively engaged with the IF-AT web application using the Collaborate talk function or IMs to discuss each question. Once consensus was reached, they selected one of the answers in the IF-AT web application.

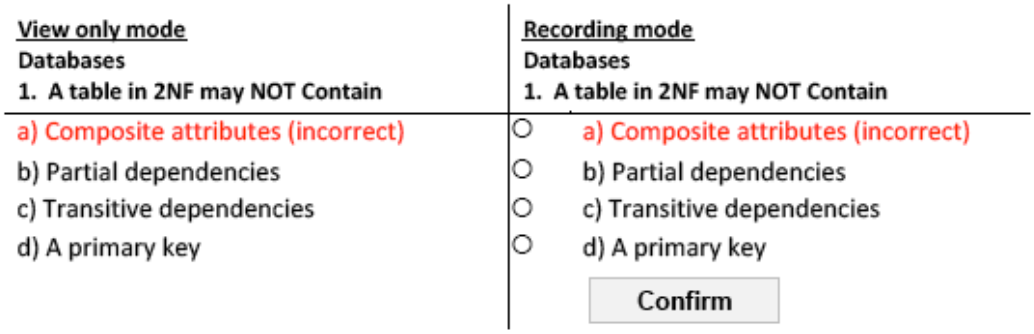

Figure 3. Example question in the IF-AT online implementation with the incorrect response. The view-only mode interface is shown on the left and the recording mode interface is shown on the right.

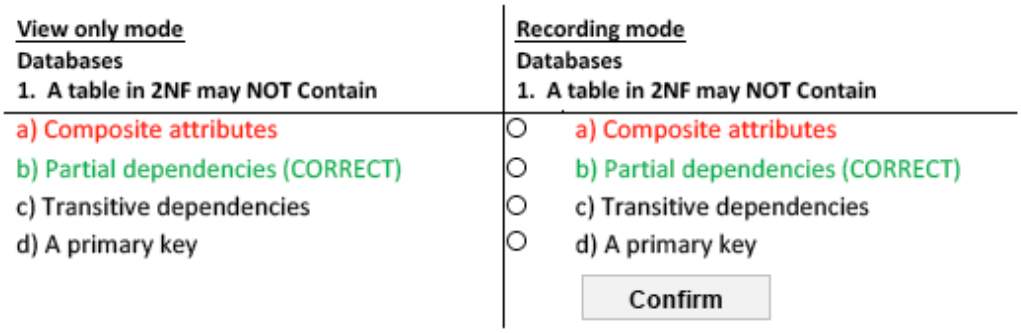

Figure 4. Example question in the IF-AT online implementation with the correct response. The view-only mode interface is shown on the left and the recording mode interface is shown on the right.

Five staff members supervised the online test for the initial trial. Two acted as moderators, switching between eight breakout rooms; students could communicate any disparities within the learning environment. Two managed any direct student enquiries (e.g. logging on, dropouts, and other technical problems, of which there were very few) and the final staff member ensured the test application was working properly. Some students were observed using the course textbook. However, this was quickly abandoned when the strict timing and short duration of the test were realised. At the end of the class, some of the students chose to put up the "applause" or "clapping hands" emoticons in Collaborate to demonstrate how they felt about the experience.

Preliminary Results and Implications

Asynchronous environments

A combination of online tools is recommended to provide a complete teamwork environment to build group dynamics. Courses A and B incorporated social media and blogs in an asynchronous environment while Course A also combined synchronous sessions with Collaborate. Blogs were used as an informal peer-review assessment tool in the Courses A and B, which the students found very helpful for developing their learning outcomes. Qualitative evidence and trends from the student perspective are shown in Table 1. A combination of asynchronous and synchronous OLEs and tools are recommended due to the state of art of current technologies. For example, Course A students used the social media learning community (in this case Facebook) to review and refresh their notes about the Collaborate breakout sessions as they cannot be recorded.

Table 1

The student perspective — Anecdotal comments about online teamwork using Facebook and Blogs in an asynchronous environment extracted from the student feedback surveys (University 1)

Trends	Example of student comments
Collaboration	• *Like: enthusiasm/involvement of all students, the fact that the lecturer posted somewhat controversial/course-related questions [on Facebook] every week to foster student involvement. Availability of the collective student body i.e. questions can be asked at any time and answered very easily. Informal yet formal.* • *Having these public blogs allows for comments and collaboration between peers, collaboration that would otherwise be non-existent if we had to email an assignment in instead.*
Using Facebook and Blogs	• *I liked sharing and reading everyone's direct views on courses [on Facebook].* • *I think it [Facebook] is very good idea to interact with many colleagues.* • *I also enjoy the use of a non-traditional format [blogging] for assignment submission, and being able to see what other people have done. This allows me to see common mistakes and make what I do better in response.*
Working in groups in an OLE	• *[Facebook] feels more like a group than working at home alone.* • *I enjoyed [Facebook] even I had some issues in the group.* • *I like that it [Facebook] brings everyone "together" in a sense.* • *I like the student atmosphere it [Facebook] brings, first time I've experienced it.* • *It [group work using blogs] allows us to view each other's work to get a better idea of what we can improve and different opinions.*
Communicating in an OLE	• *The fact that you can interact with everyone [on Facebook] which usually doesn't happen in on-line classes.* • *Group work is always difficult getting all members to contribute. Online via blogs does allow for easier communication.*
Improving the experience	• *Set groups to users at the same campus where possible or have a standard method for collaboration.* • *The Facebook page became flooded with posts and it was often hard to find the information you were looking for. I think any Major questions answered by [the teaching staff] should be put at the top of the news feed.* • *It would be better if every group had someone who will be motivated enough to actually keep others aware of the task and encourage them to work on it.*

Synchronous environments

Courses A and C incorporated Collaborate synchronous sessions. The results from both these courses found Collaborate sessions to be supportive of the development of soft skills. The students had time and space in the breakout sessions to discuss, problem solve, complete POGIL tasks and/or review the material being covered before moving on to the next topic or completing the IF-AT quizzes. Students reflected that being able to review these main room sessions helped when completing assessment items and preparing for exams.

Students employed a deep and strategic approach to learning, relating ideas and using evidence to answer each question as evaluated by the *Approaches to Study Inventory* (ASI) learning outcomes. The students' strategic approach encouraged the group to work as a team and increased their enjoyment during teamwork (Gilson, Maynard, & Bergiel, 2013). Course C students were observed to use the emoticons available in Collaborate to "raise their hand" to speak, "applause" to acknowledge presentations or a "green tick" or a "red cross" when they agreed/disagreed on a topic. Team cohesion and online group interaction were demonstrated with the use of these emoticons, which can help to develop communication, collaboration and leadership skills.

Course C's IF-AT implementation found 66% of students agreed or strongly agreed that the assessment technique was effective. As evidenced in the IF-AT specific survey and the student feedback on teaching and course, Table 2 (cf. Table 1) shows the trends from the student perspective of recognising the importance of instant feedback and working in teams online. The quantitative results showed 63% of online students agreed that "the assessment activities helped them understand the course materials", "they had received timely feedback" and "overall satisfied with the course". This reinforced immediate feedback on a student's understanding of a topic and fostered student engagement (Blackman, 2012; Gilson et al., 2013).

Table 2
The student perspective — Anecdotal comments on the IF-AT synchronous environment extracted from the student feedback surveys (University 2)

Trends	Example of student comments
Working in groups online (in an OLE)	• *Working online in groups, without living in the same location.* • *Doing external assignment teamwork is important drawing from each other's strengths.* • *You got to connect with other students.*
Communicating in an OLE	• *It gave you an idea of how you went on your individual assessment.* • *Finding out I had the right answers from the individual test.*

Improving the experience	• *More instruction and lead up work is required so all persons know how to use and interact on Collaborate… I would run a trial quiz designed to help the students who do not know how to use Collaborate, especially as it is needed for the first part of the assessment.* • *More application tutorials would have been good.*

From the teaching perspective, Course C's teaching staff commented positively about the online testing sessions, with one noting that:

> *The sessions for [the] online testing were quite astounding, having not been involved before I found the sessions, quite stimulating and exciting. Furthermore, for the first time we had students using the talk function in an online conference". "Overall, the students were very committed to achieving their learning goals ensuring the event ran very smoothly.*

Conclusion

This overview paper introduced a project that aimed to integrate effective face-to-face group work/active learning methods such as POGIL and IF-AT into an OLE to increase engagement and participation for online students. On completion, the project will report best practice and comparisons of enabling technologies that are advantageous to collaboration and group work to enhance the learning experience and the development of soft skills for ICT students.

This paper presented two traditional face-to-face TBL methodologies, POGIL and IF-AT, and methods of deployment in an OLE. POGIL virtual teamwork was implemented in asynchronous mode and IF-AT teamwork in synchronous mode. Three courses were chosen to pilot the study, a first-year business informatics course; a second-year management course that is available to ICT students; and a third-year ICT course. These diverse courses varied in enrolments (from 130 to ~300) and content.

The initial outcomes of the first pilot studies have proved positive. Qualitative evidence from the student perspective and the teacher perspective indicates that virtual group work can have the same results in developing soft skills in ICT students as face-to-face group work. Future work includes the deployment of POGIL in synchronous mode.

This paper has outlined the project and detailed preliminary outcomes. However, many facets of this study warrant greater analysis of the data collected that would exceed the scope of this overview paper. The articles to follow will complete the broader picture with in-depth analysis and results of each comparative study, including a comparison of asynchronous and synchronous OLEs using POGIL methods and a comparison of synchronous IF-AT online versus IF-AT face-to-face as the course ran simultaneously in both modes.

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The dataset is openly available via Research Data Australia under Creative Commons licensing at: https://researchdata.ands.org.au/ict-studentaposs-interpersonal-learning-techniques/456795