Cultivating ICT student's interpersonal soft skills in online teaching environments using traditional active learning techniques

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James Cook University (Lead)

Partners

James Cook University

Griffith University

Project Team

Trina Myers (Project Leader, JCU)

Anna Blackman (JCU)

Heather Gray (GU)

Jarrod Trevathan (GU)

Ickjai Lee (JCU)

Rachel Hay (Research Assistant and HDR Student, JCU)

Trevor Andersen (Research Assistant and HDR Student, JCU)

JAMES COOK UNIVERSITY AUSTRALIA

Griffith UNIVERSITY

Executive Summary

Flexible online delivery of tertiary ICT programs is experiencing rapid growth. Yet, creating an *Online Learning Environment* (OLE) that develops team building and interpersonal skills is difficult due to student isolation and the individual-centric model of learning that encourages discrete study rather than teamwork.

Many students have negative perceptions of group work because of working in dysfunctional groups and feelings of unfairness in the assessment process. 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. Due to this need to produce graduates capable of working in a team environment group exercises and projects have become an important component of higher education (Blackman, 2012; Friedman, Cox, & Maher, 2008; Myers, Monypenny, & Trevathan, 2012).

Interaction, articulation and interpersonal skills are extremely important for ICT professionals and to the development of quality ICT graduates. These skills increase the employability of graduates who can demonstrate effective communication skills with clients and colleagues (McMurtrey, Downey, Zeltmann, & Friedman, 2008). Yet, these skills are often overlooked within the curriculum, particularly with the recent shift towards online delivery (Chan, 2011).

To enhance the OLE for students, there is a need to investigate what existing teaching methodologies and tools work in the traditional environment for fostering interpersonal skills. The challenge, then, is to determine whether traditional methodologies/tools can be effectively adopted in an online environment. Two identified active learning techniques that develop soft-skills in traditional face-to-face teaching environments include Process Oriented Guided Inquiry Learning (POGIL) and the Immediate Feedback Assessment Technique (IF-AT).

POGIL is a pedagogical method devised in 1994 from cooperative and collaborative learning techniques to teach process skills as well as content using an inquiry-based approach (Moog & Spencer, 2008). POGIL group sessions aim to guide students through an exploration to construct and refine comprehension of the content (POGIL, 2014). Currently, this method is predominantly implemented in Chemistry. However, we have found that the method lends itself to analytical problem solving in ICT and Computer Science (Myers et al., 2012).

The IF-AT method transforms traditional multiple-choice testing into an interactive learning opportunity for students (Epstein, 2009). IF-AT uses a multiple-choice answer form to reinforce student learning and offer immediate feedback (Michaelsen, Knight, & Dee Fink, 2004). When used in groups, the IF-AT is particularly effective as a means for encouraging individual engagement and student-student interaction and peer instruction, encouraging active processing of course material and enhancing student learning (Blackman, 2012; Michaelsen et al., 2004).

These proven "face-to-face" active learning methodologies foster interactions, team building and learning through highly structured group work. 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.

This report outlines the methods and results of a pilot study that integrated these effective face-to-face methods into OLEs to increase student engagement and participation. A framework of best practices and experiences is presented to articulate the recommendations and working models for using currently available collaborative tools to foster collaboration and interpersonal skills for students while working in virtual groups.

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1. Introduction

This project was a pilot study to determine best practices for developing interpersonal skills for students while working in virtual groups. The virtual groups were to be implemented using *synchronous* (concurrent) and *asynchronous* (non-concurrent) technologies. Both POGIL and IFAT methods were integrated into the curriculum of three subjects:

Subject A: A first year business informatics subject with face-to-face and online offerings. The online version is available via *Open Universities Australia* (OUA) with approximately 300 students;

Subject B: A purely online third year ICT subject with approximately 150 students; and

Subject C: A second year management subject that is available to ICT students. This subject is offered in face-to-face mode and online and has collectively approximately 130 students.

This diversity allowed for both ICT and business informatics students to be assessed using small and large groups across multiple modes of delivery (i.e., face-to-face, online synchronous and online asynchronous) (Figure 1). Subject A used POGIL in synchronous time where the group work occurred concurrently. Subject 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. Subject 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.

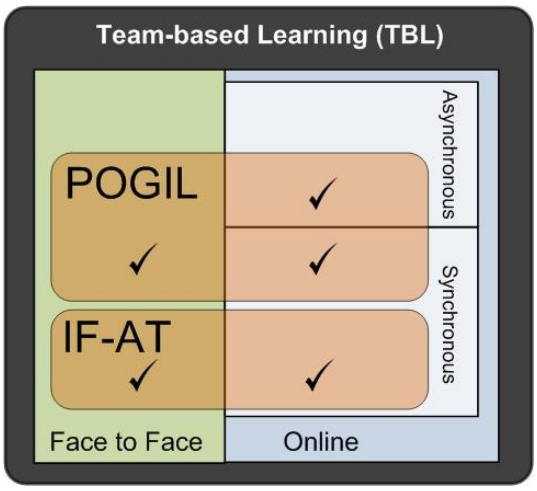

Figure 1: Conceptual map of the project scope.

This project explores the use of Web 2.0 tools, such as wikis, blogs and online collaborative forums for developing student's soft skills. These technologies provide opportunities for students to engage with a variety of information systems without requiring in-depth technical literacy. Synchronous or asynchronous OLEs can be implemented with the various technological platforms because they are available to students regardless of location and time zone as long as there is Internet connectivity.

1.1. Process-Oriented Guided Inquiry Learning (POGIL)

Process Oriented Guided Inquiry Learning (POGIL) is a student-centred 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). 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 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. The roles include "Manager", "Recorder", "Presenter" or "Reflector" (optional), which are assigned in a classroom implementation. The "Manager" ensures that all team members fulfil their roles, participate in and accomplish the assigned tasks on time, and understand the concepts (i.e., no team member is left behind). The "Recorder" scribes the group's discussions, important insights and aspects of the group's observations and the significant concepts learnt. The "Presenter" delivers oral reports to the class. The "Reflector" observes group dynamics, behaviour and performance and may report to the group (or the entire class) about how well the group operates (or what needs improvement)(Moog & Spencer, 2008; POGIL, 2014). Importantly, each role is dependent on the other roles so students are accountable to their peers for the role they play. For example, the "Presenter" must use the "Recorders" notes to present. This group structure creates positive interdependence among the students, reinforcing involvement and learning for each student(Myers et al., 2012).

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*, *convergent* or *divergent* questions. *Directed* questions can be answered directly from the information provided, *consensus* questions require groups to reach a consensus of the solution and *divergent* questions can have a range of possible responses that could all be correct. The students are expected to reach a consensus answer to each question on the activity and then communicate that answer in oral form by the "Presenter".

1.2. IF-AT Implementation

The Immediate Feedback Assessment Technique (IF-AT)(Blackman, 2012; Michaelsen et al., 2004) traditionally uses a multiple-choice tests with covered answers(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, 2009). This technique was adapted to be used in an online environment

The online IF-AT web application was developed and used in this study for group testing of students. The web application provides the questions and the functionality to record answers and provision for immediate feedback and consists of a login page, index page (listing available tests), and testing page. The testing page was designed to have 1) a view-only mode and 2) a recording mode. An account for each mode was created for each group of students. One student from each group

would log in using the recording credentials, and the others would log in using the viewing credentials.

The recorder is presented with radio buttons to choose the answer options for each question. Upon selecting an answer and clicking a "confirm" button, feedback would display immediately. A correct response would be highlighted in green and "correct" appended whereas an incorrect response would be highlighted in red and "incorrect" appended. Students who were logged in as viewers would see the same feedback within a few seconds. 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. Figure 2 shows (a) an example IF-AT question, (b) the instant feedback on an incorrect response and (c) the feedback when the response is correct.

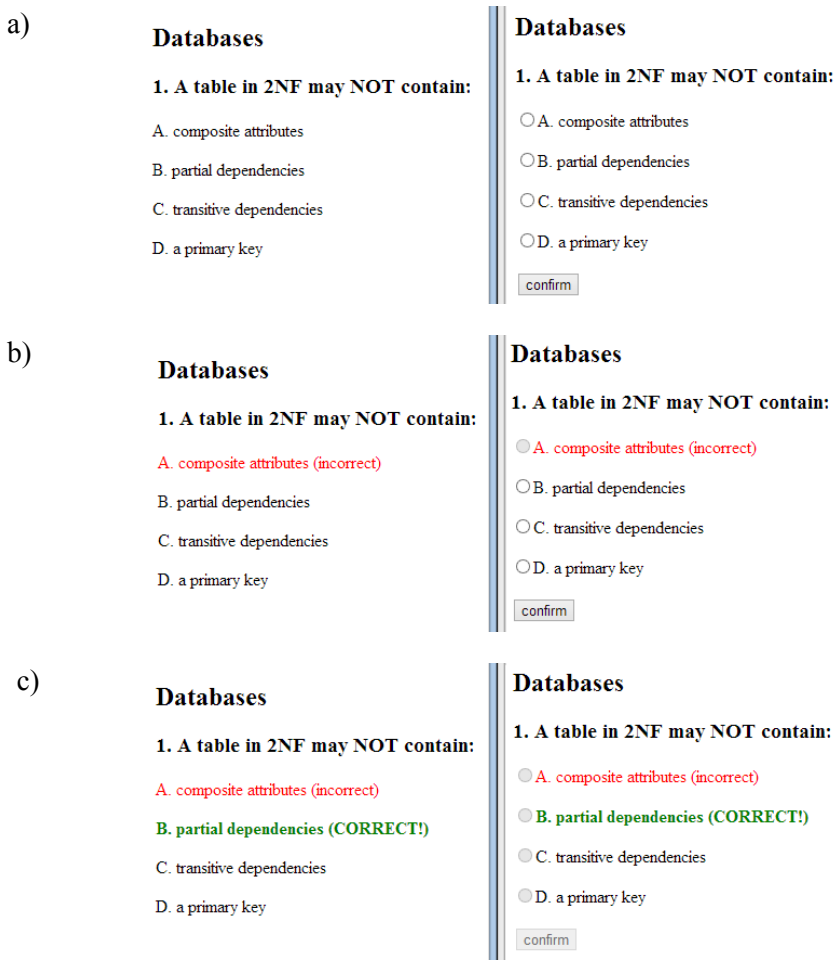

Figure 2: a) Example question in the IF-AT online implementation. b) Example with the incorrect response. c) Example with the correct response.

Students are required to study for the individual quiz prior to re-sitting the same quiz as a group. Prior study means that students are better prepared for group work and making them accountable to their group members. On completion of the individual quiz, the student's form into allocated groups and move into separate breakout rooms using Blackboard Collaborate. The students actively engaged with the IF-AT web application using the Collaborate talk function or text messages to discuss each question. Once consensus is reached, they check the answers in the IF-AT web application and proceed accordingly.

1.3. *Overview of the sample subjects*

Subject A: A first year business informatics subject with face-to-face and online offerings (approx. 300 students)

Subject A used POGIL in synchronous time where the group work occurred concurrently. The subject is delivered online through Open Universities Australia. Students are encouraged to form groups to collaborate on material that will be used to build skills, knowledge, understanding of concepts, and assessment items.

Subject B: A purely online third year ICT subject (approx. 150 students)

Subject 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.

Subject C: A second year management subject that is available to ICT students (approx. 130 students)

Subject 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 methods were implemented using current collaborative and/or online teaching tools such as Blackboard's Collaborate, social networking, wikis and blogs.

1.4. *Learning outcomes where Team Based Learning were to be applied*

A combination of online tools is recommended to provide a complete teamwork environment to build group dynamics in OLEs. Subject A and B incorporated social media and blogs in an asynchronous environment while Subject A also combined synchronous sessions with Collaborate and Subject C used Collaborate synchronously for online testing. Blogs and wikis were used as an informal peer-review assessment tools in the Subjects A and B, which the students found very helpful for developing their learning outcomes. Table 1 shows the learning outcomes where team based learning was applied.

Table 1: Learning outcomes where team based learning were to be applied

Assessment Piece	Subject A	Subject B	Subject C
Course outline	Using POGIL techniques ensure that students have a sound understanding of the principles of use, design and analysis of information systems.	Using POGIL techniques, students will focus on planning, analysing, managing, and evaluating web resources.	IF-AT group activities are used to examine key HRM functions and practices and associated issues and challenges in managing people.
Blogs/Wiki	✓		
Journal	✓		
Reflective Blog		✓	
Quizzes			✓
Portfolio Assignment			✓
Group Presentation			✓

2. Assessment where Team Based Learning was to be applied and implementation of group work– what worked and what did not?

The following tables demonstrate activities where team based learning were to be applied, what worked and what did not work. The tables also indicate where changes were implemented to improve the situation and what resulted from the changes. Table 2and Table 3 include synchronous activities and Table 4 and Table 5 include asynchronous activities.

Table 2: Synchronous activities where team based learning were to be applied

Synchronous Activities	What Worked?	What did not work?	
Co-ordinated sessions	**Collaborate sessions <u>without</u> breakout rooms** Overall, the co-ordinated sessions were positive and constructive. Using coordinated and planned activities enabled student's time to research and review materials, and to plan sessions according to the learning activity. This approach enabled students to pace themselves and plan for major assessment later in the study period. Collaborate sessions were used to facilitate tutorials where the facilitator provided instructions and then worked through a problem together with the students (similar to a computer tutorial or lab). The problem was then opened for discussion by all attendees. POGIL group work in this form was very successful in student engagement, although less successful when breakout rooms were used for group work, as discussed below.	**Collaborate sessions with breakout sessions** Blackboard Collaborate was used to facilitate POGIL discussions. Students were divided into groups and allocated to a breakout room. Collaborate sessions were not as effective using POGIL, primarily because the breakout sessions cannot be recorded. In addition, facilitators can only view and engage in breakout groups when they visited each breakout group, once away from that group the facilitator could no longer engage. In addition, students cannot record collaborate break out groups; therefore the opportunity to reflect and engage with their discussion to find solutions is unavailable. POGIL does not work in Blackboard Collaborate. Further, when students are in breakout sessions, any feedback provided by the facilitator would need to be given to each group individually as the breakout rooms in cannot be addressed as a whole in Blackboard Collaborate.	**What steps were implemented to improve the situation?** To assist with recording, the groups can be given the topics to be covered in the synchronous sessions and asked to co-ordinate and record a student facilitated synchronous session prior to a due date. The session could be conducted at any time during the designated due time period that suits the students. The "Presenter" could then report back to the larger group at the facilitator co-ordinated session.

Table 3: Synchronous activities where team based learning were to be applied

Synchronous Activities cont.…	What Worked?	What did not work?	
Group Online Test	For the group work it was apparent that the majority of groups were able to work cohesively. Having a time limit on the tests made sure that students were on task during the whole time. Having the test set up online to replicate the IFAT in the F2F version seemed to work well and helped to improve communication and development of the team.	More information sessions on how the tests were to be run would have been helpful for students especially since many of them had not completed an online subject before let alone an online group test. There may have been more anxiety about what to expect rather than the actual test. As students had to login in to two different spaces, Blackboard Collaborate and a separate website to complete the test this was administratively heaving for teaching staff. Having separate logins and password for each group was cumbersome. However, it was necessary so that each group was recording their own results and it also helped to decrease the chances of cheating in the online environment.	**What steps were implemented to improve the situation?** A separate web page was developed to host the test to make sure the IFAT was as similar as possible to F2F IFAT. This web site entailed a modal interface with two separate logins. One login for the recorder and one for the viewers. This way only one group member could record an answer on behalf of the group. **What were the results?** Overall, the two websites worked and students were able to use the Collaborate breakout sessions to communicate with each other and the external site to view and complete the group test. Notably the administrative load was heavy for staff.

Table 4: Asynchronous activities where team based learning were to be applied

Asynchronous Activities	What Worked?	What did not work?	
Social Media, Blogs and Wikis	**Facebook** Facebook was identified as a learning community, which supported all assessment. However, it was not used to assess students, but rather as a platform for dialogue between students and between students and facilitators. A large impact was felt in terms of student learning and grades. Overall, student marks increased by a whole level i.e. student grades increased from pass to credit, credit to distinction and distinction to high distinction. **Blogs** Students enjoyed the integration of blogs into the course, as many IT students are already using blogs they felt that there were no new skills to learn. The particularly enjoyed being able to use the blog throughout the course and the ability to edit the content until the due date, which allowed them to use their blog as a study aid and increase their knowledge.	**Wikis** The ability to collaborate and change other contributors content is a positive of wikis but also a weakness. Students can inadvertently remove another student's content, or worse, a whole group's content, which can lead to frustration amongst group members. This problem can be managed superficially by the instructor who can limit the students' ability to "permanently" remove information from a wiki or by using the history reversion function. However, the work completed between the time of the error and when the history is reverted will be lost. Only one student can access a wiki page at a time, which could cause delays unless multiple pages were created (e.g., one per component of an assessment item). Multiple pages could then be combined for the final submission but complexity in management of the wiki is increased.	**What steps were implemented to improve the situation?** Instructions about the use, editing tools, and moderation of the Wiki need to be distributed to the students prior to or at the commencement of the course. The quality and clarity of the instructions will determine student engagement, experience and success undertaking these activities. Other options include providing templates that could be used collaboratively in Google drive or other share spaces. However, it should be noted that students are less inclined to share documents with other students unless they are provided with an explanation of the benefits to them and their learning outcomes. **What were the results?** For future students, better understanding on how to produce and manage a Wiki.

Table 5: Asynchronous activities where team based learning were to be applied

Asynchronous Activities cont.	What Worked?	What did not work?	
Technical Issues		**Assessment** Students were unable to upload assessment due to an unscheduled upgrade of the university website, which affected their blog assignment.	**What steps were implemented to improve the situation?** Students were instructed to complete their work in a word document then upload this as an attachment, rather than submitting directly into the blog. A new submission point and new instructions for this submission were issued to the students. **What were the results?** All assessment was delivered as instructed. However, satisfaction levels of students were affected.

3. Analysis - Student Perspective

An assessment of experiences, the techniques/methods used and the student-learning outcomes was conducted to determine the effectiveness of key graduate attributes such as teamwork, communication skills, organisational skills, responsibility and accountability.

Students enjoyed the online POGIL group work and IF-AT quizzes. Considering both techniques, more than half of students involved in POGIL group work and IF-AT quizzes agreed that both techniques would benefit the way other subjects are being taught.

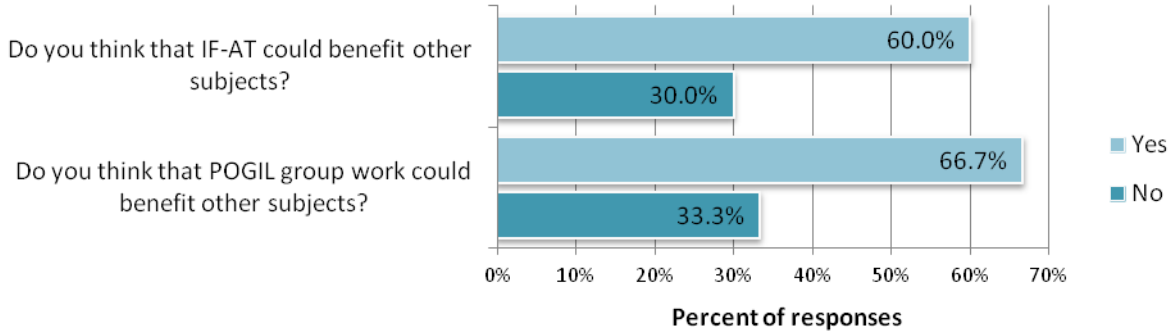

Figure 3: Benefit of POGIL group work and IF-AT to other subjects extracted from Subject A, Subject B and Subject C's feedback survey (N91)

3.1. Synchronous Environments

Subject A and C delivered course content synchronously using Blackboard Collaborate sessions, and Subject A also incorporated asynchronous delivery[1] using social media and blogs. Students were able to use breakout rooms to discuss, problem solve and complete POGIL tasks, or complete IF-AT quizzes.

Students were asked specifically about the results of POGIL group work on confidence in their ability, engagement, and how the lecturer responded to the student's level of understanding, as well as overall experience. Seventy-seven percent of students agreed that the lecturer responded to the student's level of understanding by adapting their teaching accordingly. As a result, 70.4% of students said that they felt more engaged during lectures and 66.7% of students felt more confident in their ability because of POGIL group work. Overall, more than two thirds of students (70.4%) felt that being involved in POGIL group work had been a positive learning experience.

[1] Asynchronous delivery will be discussed in the following section

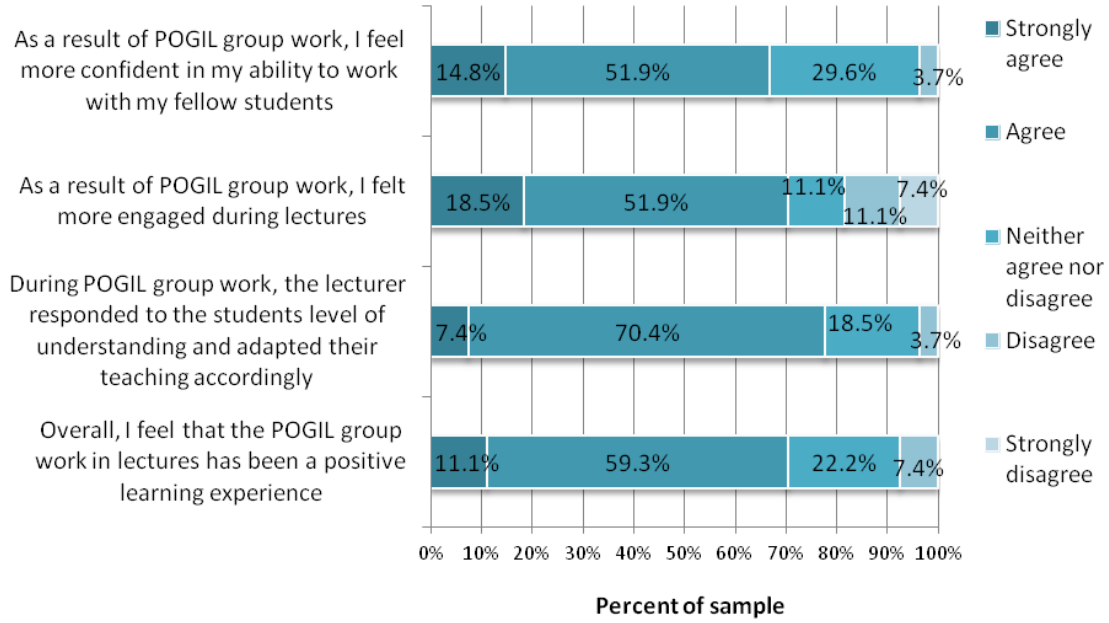

Figure 4: The student's perspective on POGIL group work in online synchronous environments extracted from Subject A's feedback survey (N27)

Student's responses about their view of the IF-AT group quiz were also positive. Nearly 80% of students identified the online quiz format to be better than other group assessment. Although 67% of the students found the group quiz to be challenging, more than half agreed that the group quiz helped students to learn from others. Nearly eighty percent of students agreed that the group quizzes provided a good review of the content. However, 55% thought that more quizzes each covering smaller amounts of material would be beneficial. Ninety percent of students agreed with the contribution of the group quiz to the overall grade.

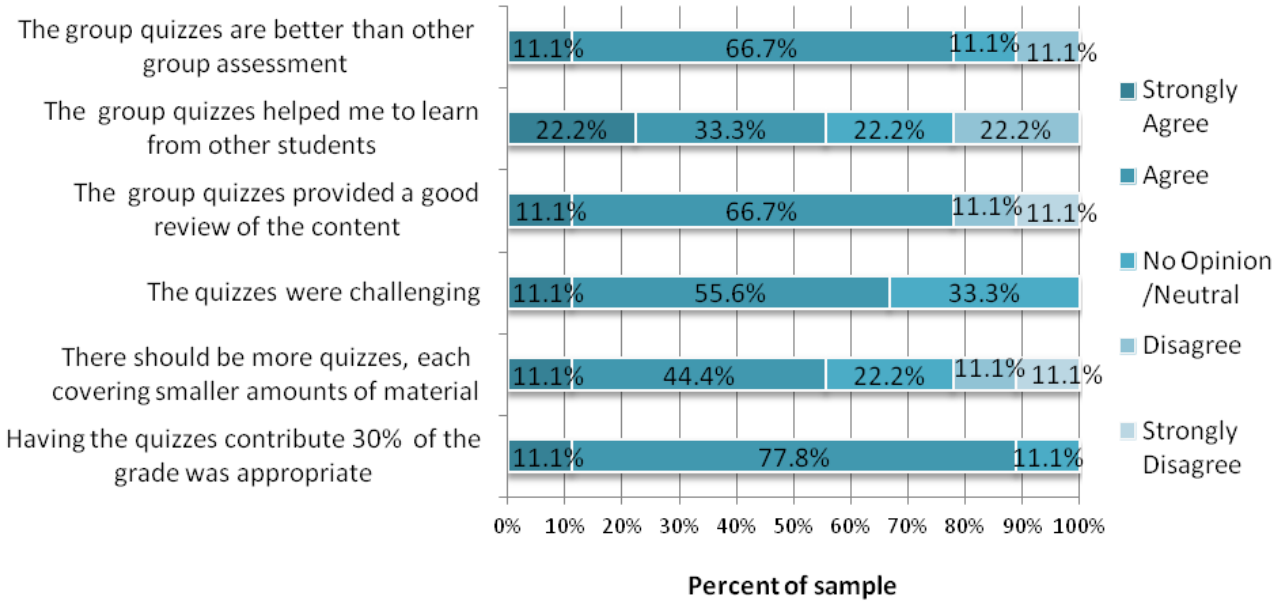

Figure 5: The student's perspective on IF-AT quizzes in online synchronous environments extracted from Subject C's feedback survey (N10)

Two thirds of students agreed that they liked the immediate feedback that the IF-AT group quiz provided. Student responses highlighted the importance of getting part marks for multiple-choice questions, and being able to work out their mark on the individual test. Sixty-seven percent of students strongly agreed that they liked that they found out the answer to every question during the group quiz and that this enabled them to learn from their mistakes. Seventy-seven percent of students agreed that they learned more using the group quiz.

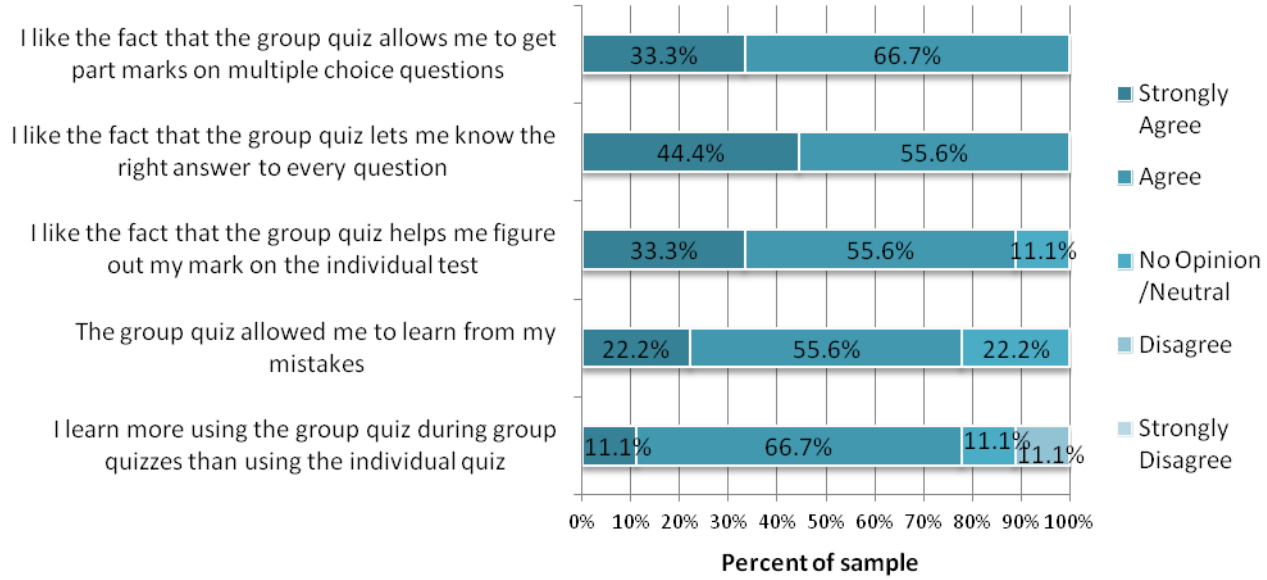

Figure 6: The student's perspective on immediate feedback in online synchronous environments extracted from Subject C's feedback survey (N10)

Feedback from the students mostly supported the online group quiz format. Students were satisfied when they got the correct answer on the first try (66.7%). However, they were more disappointed when they got an answer wrong (77.7%). Two thirds of students found the online group quiz to be fun and they thought that other courses would benefit from its use (66.6%).

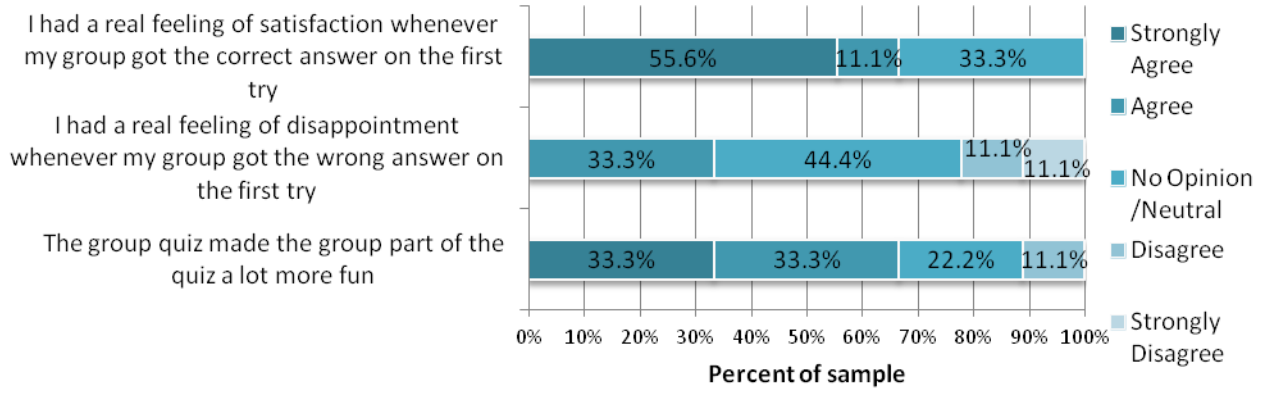

Figure 7: The student's perspective on support for IF-AT group quizzes in online synchronous environments extracted from Subject C's feedback survey (N10)

Students agreed that using Blackboard Collaborate made communication with team members easy during the online group quiz (88.9%). They felt that it was easy to interact effectively to get their point across to fellow team members (88.9%). Only ten percent of students disagreed with these statements. Seventy-eight percent of students were able to be assertive and 100% of students agreed

that the student in the role of recorder listened and recorded correctly. Overall, 100% of students agreed or strongly agree that they were satisfied with the use of the online group quizzes as an assessment.

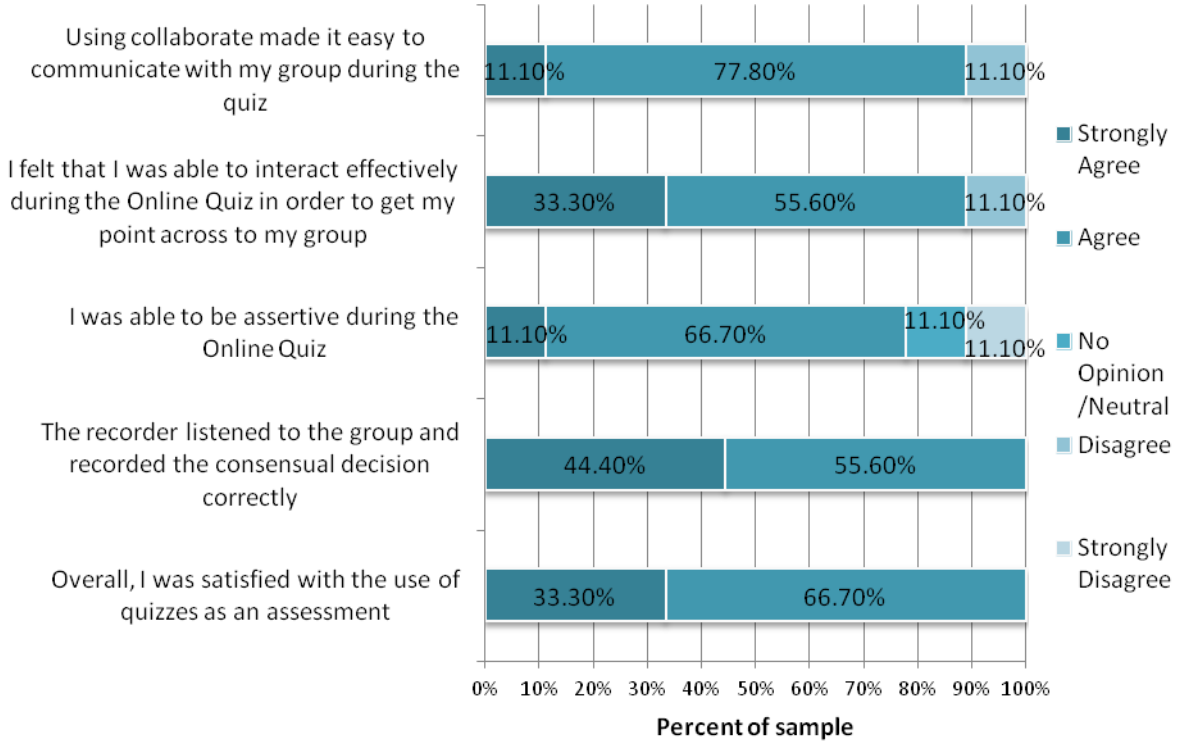

Figure 8: The student's perspective on communication and effectiveness of IF-AT group quizzes in online synchronous environments extracted from Subject C's feedback survey (N10)

Quantitative results from the institution student feedback survey showed that 63% of students agreed that IF-AT as a delivery method helped students to understand the subject material. Eighty-eight percent noted that IF-AT activities helped them to understand the content better. One hundred percent stated that they received timely feedback and 75% were satisfied overall. Receiving timely feedback reinforces immediate feedback on students understanding of a topic an fosters engagement (Blackman, 2012; Gilson, Maynard, & Bergiel, 2013). Table six highlights trends emerging from the student's perspective recognising the importance of instant feedback and working in teams in OLEs.

Table 6: The student's perspective on subject delivery, assessment activities, feedback and satisfaction extracted from Subject C's institutional student feedback survey (N10)

Please rate the subject on the following criteria:	Agree	Neutral	Disagree	N/A
The delivery methods (lectures, tutorials, practicals, fieldwork, online activities) used in this subject helped me to understand the subject material	63%	25%	13%	0%
The assessment activities helped me understand the subject material	88%	0%	13%	0%
I received timely feedback on my work in this subject	100%	0%	0%	0%
Overall, I was satisfied with this subject	75%	25%	0%	0%

Table 7: The student's perspective—anecdotal comments on the IF-AT synchronous environment extracted from Subject C's student feedback survey.

Trends	*Examples of Students' Comments*
Importance of working in teams online	*"working online in groups, without living in the same location"* *"doing external assignment team work is important"*
Considering teamwork and communication skills	*"I really enjoyed the group presentation"* *"Working in a team"* *"Discussion between group members"* *"The potential to reason with others"* *"Thinking together"*
General feelings of the working in teams in an OLE	*"Learning from others"* *"Drawing from each other's strengths"* *"You got to connect with other students"*
Immediate gauge of their performance.	*"It gave you an idea of how you went on your individual assessment"* *"Finding out I had the right answers from the individual test"*
Comments for improvement	*"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 "*

3.2. Asynchronous Environments

A combination of online tools is recommended to provide a complete teamwork environment to build group dynamics. Subject A and B incorporated social media and blogs in an asynchronous environment while Subject A also combined synchronous sessions[2] with Collaborate. Blogs and wikis were used as an informal peer-review assessment tools in the Subjects A and B, which the students found very helpful for developing their learning outcomes.

Students were asked what three things were valuable about online POGIL group work that was was valuable to their learning. Two thirds of students answered working in a team and online collaboration and meeting new people as valuable elements of POGIL group work. Forty four percent of students said that gaining different ideas and perspectives and understanding the course content and

[2] Synchronous session are discussed in the previous section

helping others was valuable. Thirteen percent enjoyed the interactivity of POGIL group work (

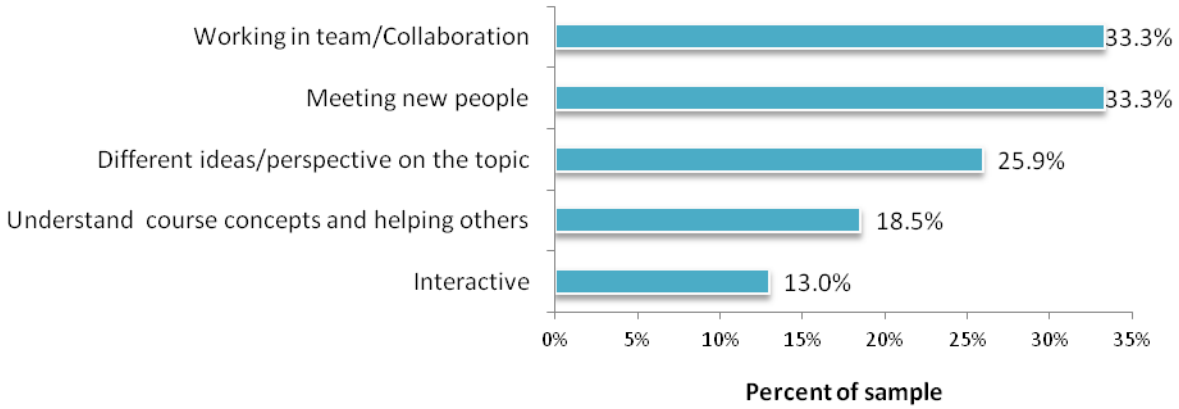

Figure 9).

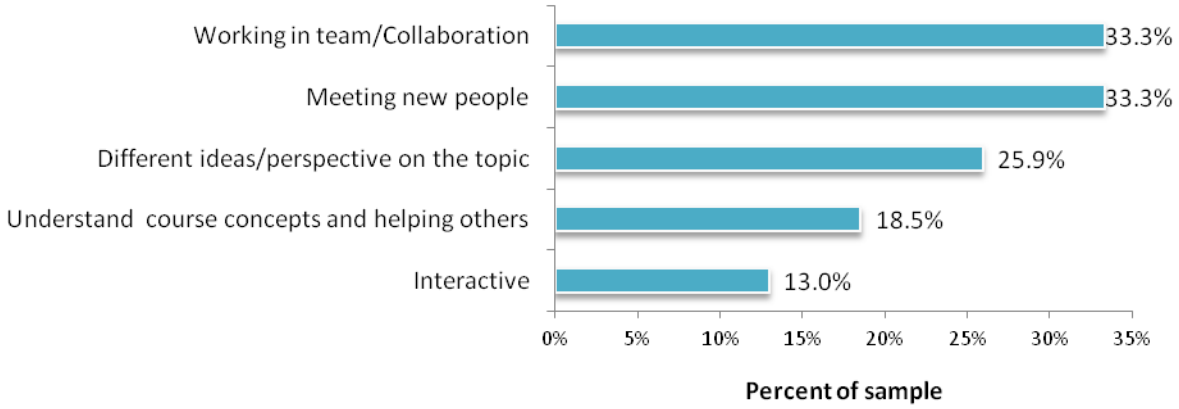

Figure 9: The students perspective on elements of POGIL group work that were valuable to learning extracted from Subject A student feedback surveys (N27)

Subject B had a combination of first time online students (35.2%) and students who had studied online before (64.8%). When asked what the students most enjoyed about using blogs in the online course, several themes emerged. For first time students being able to 'respond in a personalised manner from their own individual perspective', 'easy submission' and 'creativity' were most important, whereas for students who had studied before 'receiving instant feedback', the casual/informal aspect' of blogging and that they found blogs 'enjoyable and interactive' was the most important

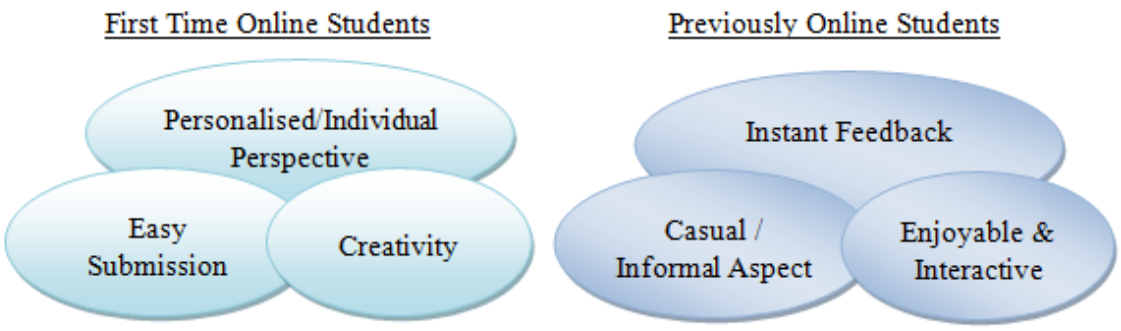

Figure 10: The student's perspective on the enjoyment of using blogs in an online course extracted from Subject B student feedback surveys (N54).

By contrast, students thought the use of Facebook in online group work was annoying. The negative responses are primarily due to large amounts of notifications and privacy concerns such as invasion of the student's private Facebook page by non-friends i.e. class mates (spying), online bullying, and too many users made it hard to find and keep track of posts. Students who liked using Facebook highlighted that Facebook was familiar and easy to use, Facebook made collaborating simple, and that Facebook encourages interaction and makes it feel more like working in a group. Table 8 and Table 9 highlight positive and negative comments about the use of Facebook and Blogs during POGIL group work.

Table 8: Student perspectives (positive) - anecdotal comments about online POGIL group work using Facebook and Blogs in an asynchronous environment extracted from Subject B student feedback surveys (N54).

Trends	Examples of Students' 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"
Considering the use of Facebook and Blogs	*"I liked sharing and reading everyone's direct views on subjects [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"
General feelings of 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"
Communication 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"
Comments for improvement	*"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"

Table 9: Student perspectives (negative)—anecdotal comments about online POGIL group work using Facebook and Blogs in an asynchronous environment from students extracted from the Subject B student feedback surveys.

Trends	*Examples of students' comments*
Collaboration	*"We all just summarized our own blogs, then put it all in one document; there wasn't much actual collaboration"*
	"We only collaborated minimally; we tended to write separate parts, then combine them into a single document"
	"Group assessments in an online course are very problematic. For groups who are unable to meet in person, or arrange any time to collaborate online due to conflicting schedules, consensus is next to impossible"
Considering the use of Facebook and Blogs	*"Let alone the demonstrably insurmountable task of organizing 4 people on the internet, the wildly variable quality of blogs makes group work extremely difficult without sounding one-sided"*
	"I feel like [blogging] is helpful. However expecting students to be active on other student's blogs is asking too much, some people barely have time to do their own blog let alone comment on others"
	"It requires a lot of self-motivation and some members just don't check messages and emails, which is detrimental to the group"
	"The Facebook page became flooded with posts and it was often hard to find the information you where looking for. I think any Major questions answered by [the teaching staff] should be put at the top of the news feed"
	"I had a group member not on FB. I hate the fact we had to use FB as our place to ask questions. Most of the time they never got answered"
Communication in an OLE	*"I am not a fan of group work, never have been. It always boils down to who does the work... Sometimes the other group members are a bit confused about what is being asked. There is no real way to ask questions"*
	"For online courses in the group when people are more than 3, it's so difficult to manage all on live chats and reach a suitable result"
	"Difficult to communicate with them that sometimes I need the answer back soon"
Comments for improvement	*"Set groups to users at the same campus where possible, or have a standard method for collaboration"*
	"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"

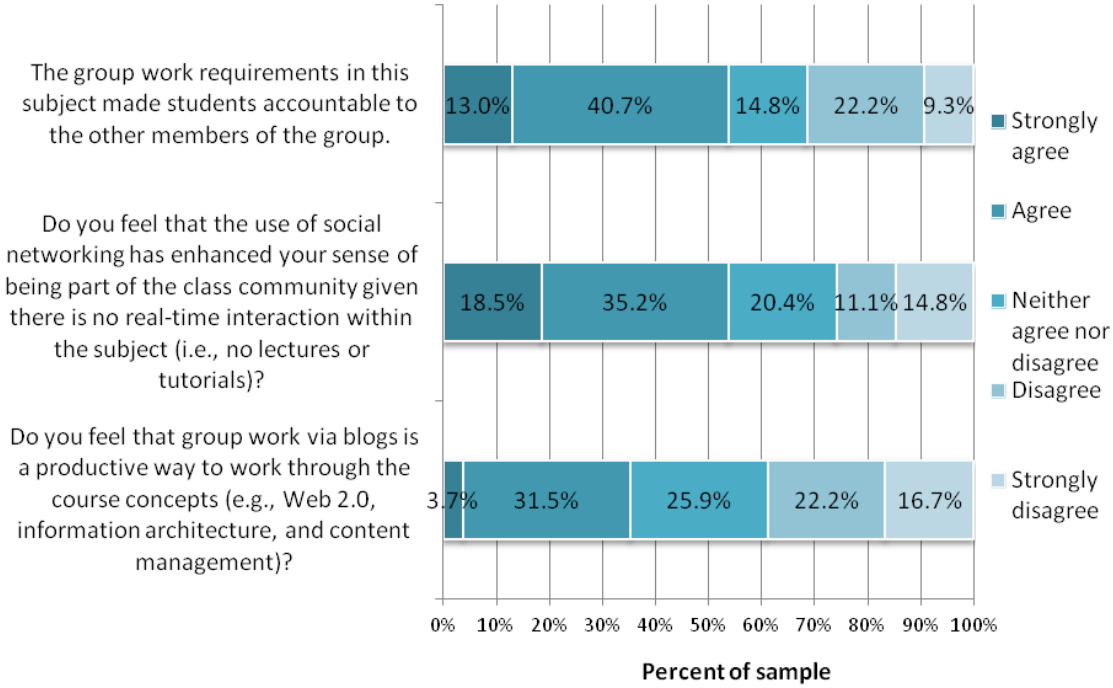

Figure 11 shows responses specific to accountability and the use of blogs and social media in building community and enhancing productivity. Fifty-four percent of students felt that POGIL group work requirements made them feel accountable to the other students in their group to participate and complete tasks. Fifty-three percent felt that using Facebook as a communication platform enhanced their feeling of community in the OLE. Developing a sense of community and therefore connectedness between students is vital to successful learning in OLEs (Selwyn, Williams, & Gorard, 2001; Thurston, 2005). Slightly more students (38.9%) found using blogs unproductive than those who thought using blogs was productive (35.2%). The negative responses may imply that students felt that working with other students in the blogging environment increased their work load, hence a feeling of lost productivity.

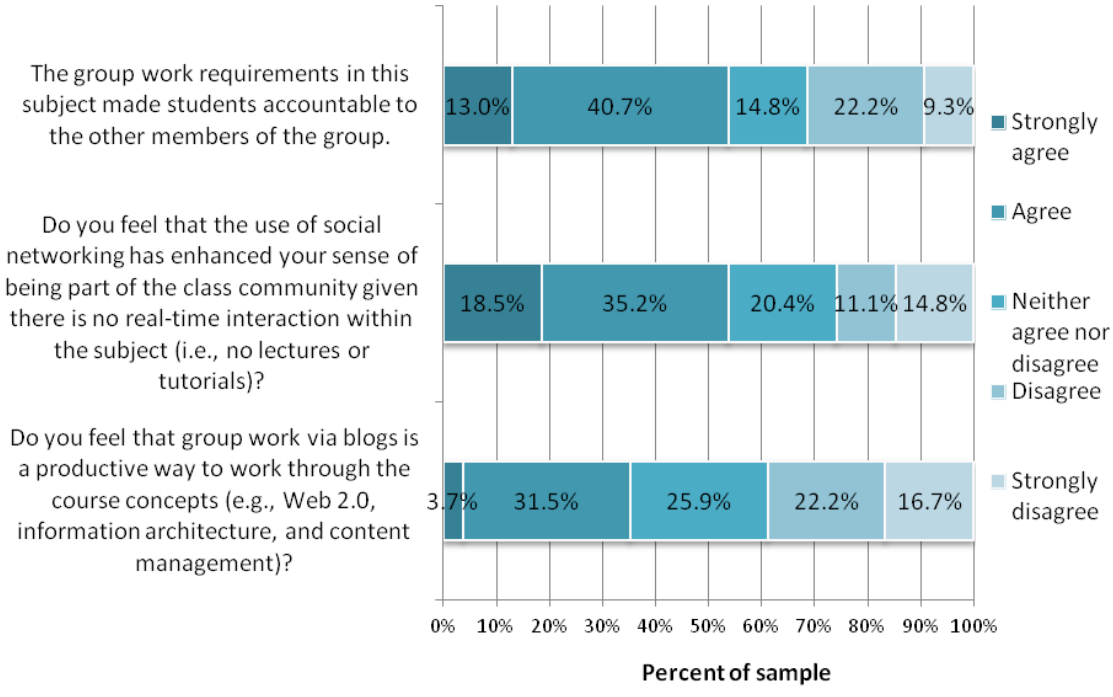

Figure 11: The student's perspective on blogs and social media for online group work in asynchronous environments extracted from Subject B feedback survey (N54)

Subject A and Subject B used a combination of Web 2.0 Tools to complete teamwork and encourage soft skills through online group work. The quantitative survey results about online group work in an asynchronous environment for both subjects A and B are shown in **Error! Reference source not found.**. There is a positive trend toward online group work being a positive experience, where half of students found that online group work helped them to create and evaluate solutions to new problems, to analyse processes and problems, and to understand, remember, explain and apply new concepts. Overall, 40.7% of students felt that online group work has been a positive experience.

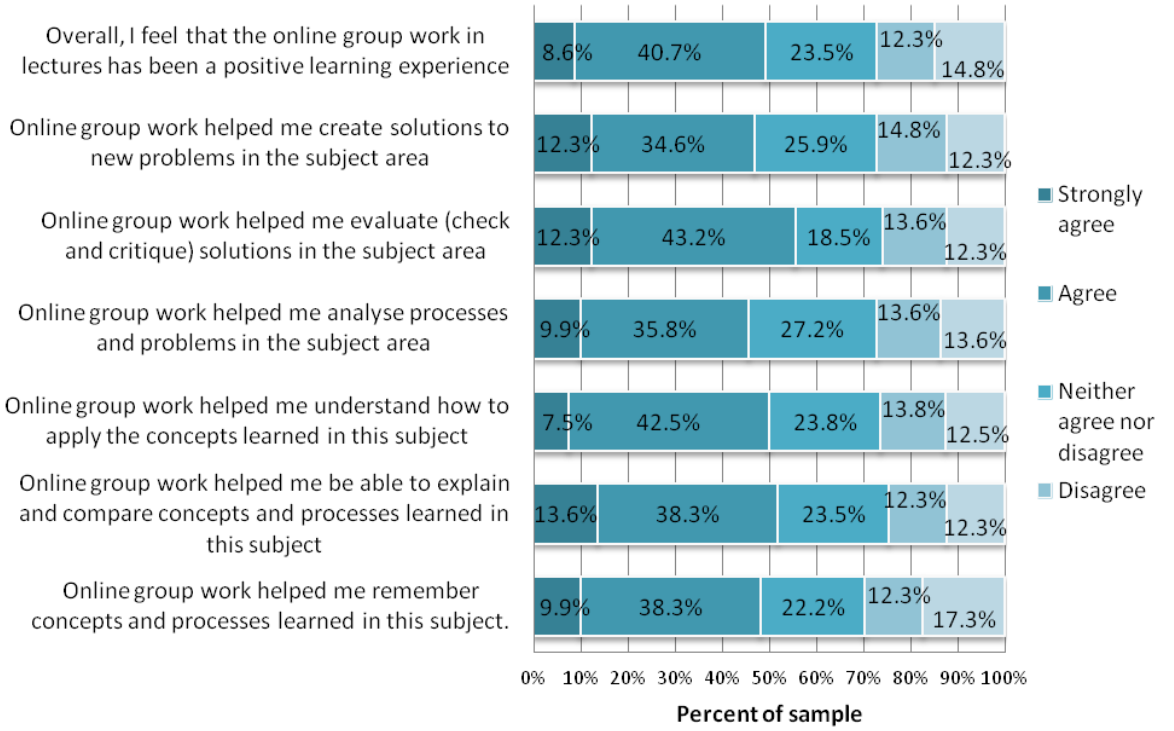

Figure 12: The student's perspective of online group work in an asynchronous environment extracted from Subjects A and B student feedback surveys (N81)

4. Recommendations

4.1. Synchronous environment - POGIL co-ordinated sessions using Blackboard Collaborate

4.1.1. Synchronous POGIL environments from the administrative perspective

Provide written instructions at the beginning of the study period for planned sessions throughout the study period, as well as how to choose, manage and plan POGIL student group sessions is strongly recommended. The provision of this material requires considerable planning by the facilitator prior to the commencement of the course as well as a clear understanding of the POGIL approach. In addition, clear and concise netiquette rules need to be provided prior to and throughout the online course.

Table 10: Administrative perspective – anecdotal comments about other things the lecturer could have done to help students more from the student feedback survey

Trend	Examples of Student's Comments
More information prior to the course starting	"Further explanation of concepts when deconstructing POGIL work." "Prior information provided to fully understand requirements and how it will work"

4.1.2. Synchronous POGIL environments from the technical perspective

To assist with recording, the groups can be given the topics to be covered in the synchronous sessions and asked to co-ordinate and record a student facilitated synchronous session prior to a due date. The session could be conducted at any time during the designated due time period that suits the students. The "Presenter" could then report to the larger group at the facilitator co-ordinated session. With regard to upgrades to the course website, the course facilitator should contact the Blackboard support staff to establish site maintenance schedules, which can then be used to manage submission dates. Otherwise, the students tended to enjoy using the university portals.

Table 11: Technical perspective – anecdotal comments about other things the lecturer could have done to help students more from the student feedback survey

Trend	Examples of Student's Comments
University Portals	"Use Learning @ institution. It is a great tool. I have had great experiences with 3 other courses online, and all had Learning @ institution as the main resource of guidance."

4.1.3. Synchronous POGIL environments from the teaching perspective

At the beginning of the subject, select appropriate groups that will work together for the entire subject and assign roles as "Manager", "Recorder", "Presenter" or "Reflector". Make the group work accountable to grades to assist with group work retention.

Table 12: Teaching perspective – anecdotal comments about other things the lecturer could have done to help students more from the student feedback survey

Trend	Examples of Student's Comments
Teams	"But it was hard to keep the same teams for all of the lectures. I think because it didn't count towards the grades. Maybe make it mandatory for the POGIL groups to stay together for all the lectures."

4.1.4. Synchronous POGIL environments from the student perspective

Students felt that there needed to be more structure for the group assignments and a dedicated online consultation period and when asked if there was anything that could be improved, students indicated that POGIL should not be held in lecture, but rather in tutorials. The students also highlighted the way groups work and recommend finding better ways for groups to work together. They also suggested the lecturer using less quizzes.

Trend	Examples of Student's Comments
More instruction	"A structure for the group assessments and an online consultation period for the course convenor could be helpful when there is ambiguity in the questions, or there are problems within groups."
	"Yes definitely. I don't think they [POGIL Group Work] should be used during a lecture, only in a tutorial situation."
	"POGIL work does not work very well in lectures … and ultimately I am barely incorporated or eager to participate."
	"It's [POGIL] a great idea however does take away the attention of the lecture sometimes.
Group structure	"Remove it from the course unless there is some way to actually ensure that groups are actually working together."
	Probably remove the idea of the group consensus, or at least apply more understandably objective criteria's. It's difficult to apply a group's thoughts when everyone has their own schedules, and whilst it can be argued that projects like these aren't uncommon in the real world...it doesn't really seem an important component to the learning.
More quizzes	"Have 20 MC quizzes and all are up to date, instead of 30."

4.2. Synchronous environment - Online tests using Blackboard Collaborate and the IF-AT web application

4.2.1. Synchronous IF-AT environments from the administrative perspective

To help alleviate external stresses for students when implementing IF-AT online in the future it is recommended that more information be given to students the test begins so that they have a better understanding of what to expect from the OLE. This would allow students to concentrate on the test rather than the logistics of doing the test.

Table 13: Administrative perspective – anecdotal comments about other things the lecturer could have done to help students more from the student feedback survey

Trend	Examples of Student's Comments
More information prior to the course starting	"More instruction and lead up work is required so all persons know how to use and interact on Collaborate. If it were me running this assignment after week 2 when groups are assigned 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."
	"Prior information provided to fully understand requirements and how it will work"

4.2.2. Synchronous IF-AT environments from the technical perspective

From the technical perspective it would be good if the test can be hosted in Blackboard Collaborate so that the students only have to login to one place rather than two different ones. This is something that can be developed for future study periods. In addition, some students suffered internet connection issues.

Table 14: Technical perspective – anecdotal comments about other things the lecturer could have done to help students more from the student feedback survey

Trend	Examples of Student's Comments
Technical	"It was quite good. I did however experience some difficulty in accessing collaborate occasionally due to internet connection issues."

4.2.3. Synchronous IF-AT environments from the teaching perspective

As most of the feedback from students was quite positive it would be worthwhile seeing if the changes to the administrative roles and providing better communication and more information to students helped to increase satisfaction with students. It will also be interesting to see if combining the test platforms into one site is possible and if this makes any difference to student satisfaction while completing the group tests

4.2.4. Synchronous IF-AT environments from the student perspective

Students commented that more instruction would have made the course more satisfying. They also debated about how groups were chosen, offering that grouping students by GPA may make group work fairer. Finally, students suggested that the lecturer provide more quizzes with less content, which would help them more.

Table 15: The student's perspective – anecdotal comments about other things the lecturer could have done to help students more from the student feedback survey

Trend	Examples of Student's Comments
More instruction	"A tutorial midway through the semester to check everyone is following the course and review."
	"Maybe provide more hints and tips on assessment that internal students may be gaining in tutorials through questioning."
	"More application tutorials could have been good. Where we are given a real life

	scenario, that doesn't have a straight forward answer, and we have to debate and think of what we would do in that situation."
Group structure	"Maybe group people by GPA. You'd have the problem of it not being fair to those with lower GPA's, but this would allow those who know the material really well to debate with one another, and would make those who were unsure debate and put their ideas out there rather than feeling intimidated and not saying anything."
	"Ensure all group members participate and not slack off during the group quiz"
More quizzes	"I would break the two quizzes into a couple more quizzes so that less content is included in each quiz."
	"Suggest another 1-2 quizzes, less content to cover in preparation"

4.3. Asynchronous environments

4.3.1. Social Media, Blogs and Wikis

4.3.2. Asynchronous POGIL environments from an administrative perspective

Instructions about the use, editing tools, and moderation of the Wiki need to be distributed to the students prior to or at the commencement of the course. The quality and clarity of the instructions will determine student engagement, experience and success undertaking these activities.

Other options include providing templates that could be used collaboratively in Google drive or other share spaces. However, it should be noted that students are less inclined to share documents with other students unless they are provided with an explanation of the benefits to them and their learning outcomes.

4.3.3. Asynchronous POGIL environments from the technical perspective

A high proportion of students commented negatively towards the use of Facebook. Comments included preferences for using other communication platforms such as Redmine, Skype, forums, email, a dedicated webpage, or a group specific Facebook page. Students suggested using a social forum more suited to discussion with a search function would enhance the online environment. Others suggested that removing the dependency on social media and instead integrating social interaction within blogs might enhance learning online. Students commented that using Skydive or Google Sheets might be an alternative to using wiki's as they may be easier to read and maintain.

Table 16: The student's perspective – anecdotal comments about the technical perspective in asynchronous environments from the student feedback survey

Trend	Examples of Student's Comments
Communication & Communication Platforms	"For online purposes, I would prefer not to use Facebook, and would rather use something like Redmine for example, that way it's easier to track the work that is done by each group member"
	"Due to the large amount of students on the course Facebook page, I would recommend that groups find another means of communication such as creating a group specific FB page, using Skype or even just email"
	"A forum would be better suited than Facebook"
	"Use of a social forum more suited to discussion with a search function, topics, categories etc. Facebook is a poor choice for academic discussion"
	"Don't mix Facebook and their Uni studies - pick a different medium, even if it is just

	an externally hosted forum"
	"Removing dependency on Facebook. Integration of "community interaction" within the actual blog posts as part of the blog requirements would probably also be good. This could be simply referencing other blogs. The Internet should be treated as a way to iteratively build knowledge"
	"Instead of using wiki at L@G to manage teams, how about you use the wiki just for collecting student's name and address, then use skydive or Google Sheets to organise students' marks? It makes it much more easier to read and maintain, as everything is fit into columns, and even you can apply functions to them!"

4.3.4. Asynchronous POGIL environments from the teaching perspective

A high proportion of students also commented more interactivity would enhance their experience. Students suggested pre-recorded lectures, an interactive website, videos and online reading material as elements that may enhance online learning. In addition, they suggested that using real identities my deter infighting and other forms of bullying.

Table 17: The student's perspective – anecdotal comments about the teaching perspective in asynchronous environments from the student feedback survey

Trend	Examples of Student's Comments
Learning Experience	"… this course needs to have more interaction with it's students. Maybe a pre-recorded "lecture" or an interactive website where we can learn and ask questions"
	"Video tutorials would help in a big way"
	"Video! People might be a bit calmer in the chats if they had to show their real faces. That did let the course down"
	"The use of videos to explain sections. Lecture slides in which aren't just a garble of info where they are put into practise throughout not just some parts in a blog here or there"

4.3.5. Asynchronous POGIL environments from the student perspective

Students recommended more quantitative assessment, access to individual marks and progress indicators would enhance student experience in an online environment. In addition, some students felt disadvantaged by being marked on "enhancements" stating that class mates had an opportunity to "buy marks" using purchased backgrounds and formatting, recommending that marks are not allocated to enhancements. Further, students recommended that in terms of assessment requirements and deadlines instructions that are more specific would enhance the experience of online students. Other recommendations include more online group activities to enhance cooperation within groups and set online consultation periods for the course convenor as important to enhancing the online experience.

Table 18: The student's perspective – anecdotal comments about the student perspective in asynchronous environments from the student feedback survey

Trend	Examples of Student's Comments
Assessment	"Judging by the Facebook page, we'd all like something a bit more quantitative than smiley-face marks. I originally liked the blogging because I had an excuse to research some topics of interest such as privacy, but I was completely dissuaded when I realised you were just after

	pictures and videos”
	“More/ better feedback. Instead of smiley faces I would like suggestions on how to improve my blogging skills/marks”
	“Make marks for individuals available so a student knows how they're doing in the course”
	“Progress indicators with a last updated status for each student. For those who start off with a good indicator, they won't care. However, for those who are off to a bad start and actually make an improvement, it is discouraging to still see the bad emoticons and not know if it's up to date or outdated. This eventually leads to frustration and a "F*** this course [attitude]."
	“Marking criteria. Remove the "enhancements" marking criteria. If you're going to use Wordpress as a good example for a blogging site then get rid of the allocated marks. You're basically saying that students will most likely have to purchase themes in order to get a better grade”
	“When it comes to blogging be more specific with requirements”
	“More information in detail”
	“Having certain group deadlines enforced i.e. draft consensus blog due by xx/xx/xx then finalized consensus blog due by xx/xx/xx”
	“More group activities online because that is very challenging task to cooperate with the team”
	“Maybe more activities/discussion topics via Facebook”
Consultation	“A structure for the group assessments and an online consultation period for the course convenor could be helpful when there is ambiguity in the questions, or there are problems within groups”
	“An online set time where the students can ask questions and get answers from the lecturer each week. It would have to be on the blog/quiz of the week or lecture content of that week"

5. Conclusion

This report provides an overview, results and recommendations of a project, which was a pilot study to determine best practices for developing interpersonal skills for students while working in virtual groups. The virtual groups were to be implemented using *synchronous* (concurrent) and *asynchronous* (non-concurrent) technologies. Both POGIL and IFAT methods were integrated into the curriculum of three online university subjects. The sample size varied in student enrolments (130~300). Two traditional face-to face team based learning methodologies; POGIL and IF-AT were adapted and tested in an OLE. POGIL online group work was implemented in asynchronous mode and IF-AT online quizzes in synchronous mode.

Synchronous activities included co-ordinated sessions and group online tests. The co-ordinated sessions used Blackboard Collaborate both with and without breakout rooms. The sessions without breakout rooms were positive and constructive. The approach enabled student's time to pace themselves and plan for future assessment. The sessions with breakout rooms were not as effective. Primarily because when students enter the breakout rooms, they session can no longer be recorded for students to recall for reflection and group discussion later. In addition, facilitators can only engage with a single breakout room at any one time, which removes contact with the group as a whole. To improve Collaborate sessions with breakout rooms, it is suggested that students be given the topics to be covered during synchronous sessions. Students may then record a synchronous session to be presented to the whole group at the facilitator co-ordinated session. The group online tests were cohesive and engaging. The online IF-AT test helped improve communication and development of soft skills. However, students felt that more information was needed on how the tests would be run prior to the first test to reduce exam anxiety and familiarise themselves to the online testing environment.

Asynchronous activities included using social media, blogs and wikis. Social media, in this case Facebook, was identified as a learning community. Facebook was not used for assessment, but rather as a platform for a dialogue between students and facilitators. A large and positive impact towards grades can be attributed to the use of social media as a platform for dialogue between students and students and facilitators. Blogs were also successful, students enjoyed being able to edit content until the due date, which allowed them to contribute to and to increase their knowledge throughout the course. By contrast, Wikis were not as effective. Difficulties were identified through removal of other students content, whether by accident or on purpose, leading to frustration amongst group members. In addition, only one student can access a Wiki at one time without creating multiple pages and increasing administrational duties. Prior to commencing the course, students should receive and read an instruction manual outlining the use, editing tools, moderation of the Wiki as well as templates to be used collaboratively.

During the POGIL activity, an unscheduled upgrade of the university website occurred, which affected the blog assignment and its due date. Students were instructed in alternative submission processes and an extension was granted. All assessment was delivered as instructed. However, satisfaction levels of students were affected.

Overall, the study was a success. Both POGIL and IF-AT participants reported having a positive experience. Both groups agreed that the activities helped them to understand the material better, and better apply concepts, processes and solutions in the course. This study has shown that TBL processes can be interwoven into online courses, engaging students and developing soft skills using current technologies.

6. References

Blackman, A. (2012). The Immediate Feedback Assessment Technique (IF-AT): an innovative teaching technique for human resource management students. *The Business Review, Cambridge, 20*(2), 59-72.

Chan, V. (2011). Teaching oral communication in undergraduate science: Are we doing enough and doing it right? *Journal of learning design, 4*(3), 71-79.

Epstein. (2009). What is the IF-AT? Retrieved Sept, 2013, from www.epsteineducation.com/home/about/default.aspx

Friedman, B., Cox, P., & Maher, L. (2008). An expectancy theory motivation approach to peer assessment. *Journal of Management Education, 32*(5), 580-612.

Gilson, L. L., Maynard, M. T., & Bergiel, E. B. (2013). Virtual Team Effectiveness: An Experiential Activity. *Small Group Research, 44*(4), 412-427. doi: 10.1177/1046496413488216

McMurtrey, M. E., Downey, J. P., Zeltmann, S. M., & Friedman, W. H. (2008). Critical skill sets of entry-level IT professionals: An empirical examination of perceptions from field personnel. *Journal of Information Technology Education, 7*, 101-120.

Michaelsen, L. K., Knight, A. B., & Dee Fink, L. (2004). *Team-Based Learning: A Transformative Use of Small Groups in College Teaching*. Sterling, VA: Stylus Publishing.

Moog, R. S., & Spencer, J. N. (2008). *Process Oriented Guided Inquiry Learning (POGIL)*. USA: American Chemical Society, Oxford University Press.

Myers, T., Monypenny, R., & Trevathan, J. (2012). Overcoming the glassy-eyed nod: An application of process-oriented guided inquiry learning techniques in Information Technology. *Journal of learning design, 5*(1), 12-22. doi: https://www.jld.edu.au/article/view/97

POGIL. (2014, 2011). Process-oriented guided inquiry learning. Retrieved 10 September, 2014, from http://pogil.org/

Selwyn, N., Williams, S., & Gorard, S. (2001). 'E-stablishing a Learning Society': the Use of the Internet to Attract Adults to Lifelong Learning in Wales. *Innovations in Education and Teaching International, 38*(3), 205-219. doi: 10.1080/14703290110052302

Thurston, A. (2005). Building online learning communities. *Technology, Pedagogy and Education, 14*(3), 353-369. doi: 10.1080/14759390500200211

Trevathan, J., & Myers, T. (2013). Towards online delivery of process-oriented guided inquiry learning techniques in Information Technology courses. *Journal of learning design, 6*(2), 1-11.

Trevathan, J., Myers, T., & Gray, H. (2014). Scaling-Up Process-Oriented Guided Inquiry Learning Techniques for Teaching Large Information Systems Courses (in print). *Journal of learning design*.

7. Papers in Preparation

Trevathan, J., Myers, T., & Gray, H. (2014). Scaling-Up Process-Oriented Guided Inquiry Learning Techniques for Teaching Large Information Systems Courses (in print). *Journal of learning design*.

Myers, T., Blackman, A., Andersen, T., Hay, R., Lee, I., Gray, H., & Trevathan, J. (2014). Traditional team-based learning techniques applied in online learning environments to develop interpersonal soft skills for ICT students (in review). *International Journal of Educational Research*.

Myers, T., Blackman, A., Andersen, T., Hay, R., Lee, I., Gray, H., & Trevathan, J. (2014). Cultivating ICT students' interpersonal soft skills in online learning environments using traditional active learning techniques (in review). *Journal of learning design*.