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Precious MeTL: Reflections on the use of Tablet PCs and collaborative interactive software in peer-assisted study sessions

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Precious *MeTL*: Reflections on the use of Tablet PCs and collaborative interactive software in peer-assisted study sessions

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ABSTRACT
Peer-Assisted Study Sessions (PASS) is an academic mentoring program, where high-achieving senior students assist small groups of first years in study sessions throughout semester. One of the challenges PASS Leaders face at Monash in conducting their classes is the limited time they have with their students. The current paper explores, through action research, the use of Tablet PCs and an interactive, online whiteboard software suite called *MeTL* to increase the efficiency of time spent learning and sharing. The PASS Leaders found that while some difficulties remained, the advantages of using the Tablet PCs and the software were significant, particularly for student engagement, increasing time efficiencies, student collaboration and encouraging real-time feedback to the PASS Leader.

AN OVERVIEW OF PASS AT MONASH UNIVERSITY
Peer-Assisted Study Sessions (PASS) is an academic mentoring program in which successful senior undergraduate students (PASS Leaders) run study sessions for small groups of first year students. Developed at the University of Missouri Kansas City, where it is known as Supplemental Instruction (SI), the key characteristics of PASS are (Hurley et al., 2006; Jacobs et al., 2008; Blunt, 2008; Rogan, 2010; Van der Meer & Scott, 2009) that:

- the program targets difficult units rather than remedial students
- attendance by first year students is voluntary
- PASS sessions are regularly-scheduled and co-curricular (i.e. supplemental to regular contact hours)
- the role of the PASS Leader is that of facilitator rather than tutor
- in addition to reviewing unit content there is a strong focus on the first year students developing transferable study skills necessary for success in higher education.

The Monash University PASS Program was initiated in 2008. The Program now supports students in all ten of the University's faculties and on all six of its Australian campuses. As of Semester 1, 2012, some 80 PASS Leaders are employed by the University, running more than 140 weekly study sessions across 35 units.

The PASS pedagogy: Cooperative learning

The PASS pedagogy is founded on engagement, participation and cooperation. Individual accountability is fundamental to the success of cooperative learning, as is the idea of positive interdependence (Johnson & Johnson, 2002). Thus, learning in PASS sessions is an active and inclusive process (Blunt, 2008; Couchman, 2009).

Many Monash PASS sessions are composed of problem-based activities in which pairs or small groups of students are asked to solve a given problem and present their solution and method to the whole learning group (Hurley et al., 2006; Blunt, 2008).

Students discuss the different ideas, comparing and contrasting not only the final products but also the processes used to reach them:

> By working in a cooperative manner within a peer group to reach common goals, students are more engaged and are more socially and educationally motivated to learn when they can contribute their own knowledge and benefit from one another (Ning & Downing, 2010, p. 923).

These discussions focus on high-level thinking skills and help develop critical thinking skills (McGuire, 2006; Blunt, 2008).

The shift in learning paradigm from the traditional classroom model to a cooperative learning model (Jacobs et al., 2008) can be hard for some first year students to make. A key role of the PASS Leader as facilitator is to create an appropriate learning environment – student-centred, non-threatening and empowering (Burgan & Congos, 2008; Ning & Downing, 2010) – and draw students into the discussion (Couchman, 2009; Burgan & Congos, 2008).

To facilitate cooperation and discussion, students are often encouraged to work together to present their outcomes to the problems set by PASS Leaders visually, explaining their reasoning and contrasting their approaches (Hurley et al., 2006), and this is particularly true in the Science, Technology, Engineering and Mathematics (STEM) disciplines (Van Lanen & Lockie, 1997; Knight and Wood, 2005). In many PASS sessions, the whiteboard is the most important learning tool.

IDENTIFYING THE PROBLEM

The efficient and effective presentation of visual information is of particular importance to the success of PASS sessions in three of the major disciplines in the Monash PASS Program:

- In the core biology units in Biomedical Sciences (BMS), students are often asked to draw and label diagrams of cells and illustrate the stages of developmental or transformative processes.
- In a compulsory JAVA programming unit in Information Technology (IT), students are often asked to write programming code to achieve specified outcomes.
- In the core organic chemistry units in Pharmacy and Pharmaceutical Sciences (P&PS), the answers to most problems are illustrated using molecular diagrams and sophisticated reaction mechanisms.

Observations of sessions in these units by the PASS Supervisor highlighted the problems of (a) wasted time as students prepared to present their ideas to the group and (b) of the lack of opportunity in many sessions for the concurrent comparison of solutions and workings – due, for example, to the small size of the whiteboard.

These very practical issues of minimising wasted time and maximising the potential to compare and contrast different solutions and methods in PASS sessions are the problems at the heart of this research project. In turn, the need to involve the PASS Leaders themselves in the development, implementation and evaluation of a potential solution determined the design and method of the project.

METHOD: ACTION RESEARCH

From the start, the approach taken was that this would be a classroom action research project: "inquiry and discussion of what promotes effective student learning" (Smith-Stoner & Molle, 2010, p. 313). Its aim was to make practical improvements to the efficiency and effectiveness of PASS sessions at Monash. The direction of the project would be driven by the PASS Leaders themselves, and it would be reflective (Kember, 1998).

Action research is reflective by definition, and a key aspect of the professional development of the Leaders at Monash as effective PASS practitioners is encouraging a

"reflective and inquiry-orientated approach" to their work (Leino-Kilpi, 1990, cited in Drevdahl et al., 2002, p. 414). This project was seen as an important opportunity to involve PASS Leaders in a practical project aimed at better meeting the needs of their students that required them not only to describe *what* they did but to also reflect on *why*, and *how* their actions have shaped their ideas of effective teaching and learning (Marcos & Tillema, 2006 and Skalicky, 2008).

A typical four-stage action research method was used (Raubenheimer & Myka, 2005): (1) identify the problem (see above) and raise questions; (2) plan and implement appropriate actions; (3) observe outcomes; and (4) evaluate and reflect on outcomes.

Possible Solutions

PASS sessions at Monash are usually run in tutorial rooms. As at any large university, there is tremendous variety in the furniture and equipment available across the rooms used for PASS, and this impacts significantly on the potential for effective cooperative learning to occur (Smith-Stoner & Molle, 2010). Nonetheless, the variety of rooms used for PASS sessions did allow Leaders to experiment with a variety of methods of students presenting visual information for analysis and discussion. However, as described in Table 1 below, each had important limitations.

Table 1: Existing methods of presenting visual information in PASS sessions

Method	Advantages	Limitations
Whiteboard	• Available in all tutorial rooms used for PASS sessions • The larger the whiteboard, the more useful it is	• Drawing diagrams or writing code is time-consuming • Often space is lacking to allow different ideas to be compared side by side • Information has to be wiped clean between presentations, with no opportunity to save a record, unless students copy from the board (time consuming) or use their smart phones to take photos (not all students have these)
Electronic "smart boards"	• Offer a limitless number of screens upon which to write, with the possibility of instant switching between images to compare ideas (similar to selecting slides from a PowerPoint presentation)	• While the number of rooms equipped with these boards is increasing, they are still only found in a small minority of rooms • Although any number of new screens can be created without erasing previous information, the relatively small size of these boards means that only one or two students at a time can be writing/drawing
"Idea Paint" – walls painted so they function as whiteboards	• Small groups of students have space to prepare and present visual information concurrently • Students can move around the room comparing answers and approaches (and, where appropriate, making annotations)	• Only available in a very limited number of rooms
Butcher's paper	• Small groups can prepare and display visual information concurrently	• The sheets of paper are too small to illustrate more complex answers • Errors are difficult (and messy) to correct • Again, students can't keep a record of the information for future reference unless they copy or photograph it
Overhead Projectors (OHP)	• Small groups can prepare information concurrently • Although only one group can present their information at a time, it is easy to switch between transparencies to compare ideas • Information can be photocopied by the PASS Leader onto a transparency (OHT), making it is re-usable resource	• Many tutorial rooms no longer have them, while document projectors (for paper, rather than plastic transparencies) are only found in lecture theatres • A4 OHTs are too small to illustrate more complex answers • Easier to amend than butcher's paper, but can still be messy

A NEW SOLUTION: MONASH E-TEACHING AND LEARNING (*METL*)

Through its eEducation Centre, Monash has been investigating the potential for Tablet PC-based teaching and learning to "offer a more engaging and participatory approach by using collaborative software to enhance and facilitate the learning experience and provide peer-to-peer instruction" (Bailey et al., 2011, p. 17). This identification of the peer-to-peer instruction potential of Tablet PC-based software confirmed the findings by Koile and Singer in their earlier classroom trial of Tablet PCs that, "the opportunity to work problems, submit answers, and receive immediate feedback can be a factor for high performing students" (2008, p. 5). This finding clearly aligns the use of Tablet PCs with the learning outcomes of PASS.

The Monash eEducation Centre has developed, trialed and is progressively rolling out *MeTL*, an interactive, persistent and collaborative software program developed for use on Tablet PCs. The feature of *MeTL* that made it attractive to PASS was that it can

function as a shared interactive smart board. *MeTL* has a variety of operational modes appropriate for different stages of a PASS session. Students can work in pairs or small groups with their Tablet PC set in 'private mode' to complete learning activities, before switching to 'public mode' to share their ideas with the PASS Leader and other students. In 'collaboration disabled mode', only the PASS Leader can annotate information for the group, but in 'collaboration enabled mode', each student can make annotations that are visible to all. Students can also privately submit their annotations to the PASS Leader for them to display and discuss.

From whatever starting point the Leader chose, whether a PowerPoint slide from a lecture, an incomplete diagram or chart, an image, or simply a blank screen, students could work in small groups to create their answers on the Tablet PCs. The PASS Leader could, wirelessly from their own Tablet PC, monitor student work and, as appropriate, select answers from different groups to display, anonymously, to the whole group through a data projector.

Thus, the PASS Leader would be able to monitor progress on the given task and give immediate feedback as required. The anonymity of student work can help create a safe learning environment in which students can feel more comfortable taking risks (Bell, 2001). The Leader is then able to select the answers and workings of different groups to display to the whole group to highlight interesting features (or issues) and generate discussion – all without the students having to leave their chairs.

Following discussions with experienced Leaders on the issues around the preparation and presentation of visual information in PASS sessions, the PASS Supervisor proposed to the eEducation Centre a trial of *MeTL* in PASS in Semester 2, 2011. Given that the primary role of the eEducation Centre is not the development of learning technologies but rather the adoption at the University of more engaging, participatory and collaborative approaches to teaching and learning, the Centre gave the trial its full support and assigned its Instructional Designer to assist in the implementation and evaluation of the PASS *MeTL* trial.

Scope of the PASS *MeTL* Trial, Semester 2, 2011

Experienced PASS Leaders, those with at least two semesters in the role, from Biomedical Sciences, IT and Pharmacy were invited to participate in the trial. Seven Leaders accepted: three from Biomedical Sciences and two each from IT and Pharmacy. Each of the seven Leaders received training from eEducation in the use of *MeTL*, and each was loaned a Tablet PC for the duration of the semester.

eEducation also loaned the PASS Program a further 24 Tablet PCs, with eight Tablet PCs being allocated to each of the three participating faculties. These were stored (and their batteries recharged) in secure offices in each faculty, and collected by the Leaders to take (in trolleys) to their PASS sessions. Not only was 24 the maximum number of Tablet PCs available for the trial, it was agreed from the outset that in the interest of encouraging cooperative learning it would be best for the first year students in the PASS sessions to share one computer between two or three, rather than for each student to have their own.

Each PASS Leader was timetabled to run two PASS *MeTL* sessions per week, and an eEducation technician was present for each Leader's first session to troubleshoot any technical problems that arose.

Evaluation of the trial

The focus of the trial was on the practicality of using the Tablet PCs and *MeTL* in PASS sessions – the idea being that a successful small-scale trial might lead to a broader rolling-out of *MeTL* across the Monash PASS Program. Thus, the overall question to be addressed was very simple: did the use of *MeTL* enhance the PASS sessions?

Behind this question, of course, was a list of others relating to the goals of PASS:

- Did *MeTL* help create a safe environment for participation and risk-taking?
- Did *MeTL* encourage cooperative learning and result in more and deeper discussion and debate?
- Did *MeTL* work better with some types of students than others?
- Did *MeTL* save time in sessions, or cost time? Did it allow students to spend a greater proportion of session time processing information through solving problems, and learning from each other (Koile and Singer, 2008)?
- Did *MeTL* give the Leader a clearer picture of the understanding of their students, and opportunities to give more immediate feedback to students?
- What was the optimal ratio of Tablet PCs to students?

As the trial progressed and the Leaders became more familiar and confident with the capabilities and opportunities afforded by *MeTL*, we became interested in the diverse ways in which the PASS Leaders were using it. What types of learning activities were more easily completed with, or without *MeTL* (Koile & Singer, 2008)? Finally, the Leaders were asked to reflect on the impact using *MeTL* had had on their own approach to how they facilitate PASS sessions.

The focus of the trial was on the experience of the Leaders themselves with *MeTL*, and the participating Leaders were invited to reflect on their experiences both during and at the end of Semester 2, 2011. As is described below, one of the Leaders quickly withdrew from the trial. Of the remaining six, three agreed to reflect more deeply on their experience in the trial and co-author this paper. The reflections of the PASS Leaders have been supplemented by information gathered by the PASS Supervisor and eEducation Instructional Designer during observations of PASS *MeTL* sessions in Semester 2, 2011.

FINDINGS

Difficulties

The difficulties experienced by the Leaders and their first year students were either technical in nature or related to the process of adjusting to using the new technology.

Although students can use *MeTL* and share information viewing only the screens on the Tablet PCs themselves, for a more engaging and inclusive discussion to occur, it was far preferable to be able to project information onto a wall or screen. Unfortunately, one of the IT *MeTL* PASS sessions was scheduled in a room without a data projector. It was not possible to find an alternative room, so the Leader stopped using *MeTL* in that session.

The more significant technical issues, however, were with the Tablet PCs themselves. The Tablet PCs available for the PASS *MeTL* trial were relatively old and could, unfortunately, be unreliable. Most of the participating Leaders regularly experienced one or two machines freezing in the middle of a session. One of the Pharmacy Leaders, however, found the reliability issue to be too detrimental to his sessions, and decided to withdraw from the *MeTL* trial altogether.

MeTL requires access to the University's wireless Internet network. The Tablet PCs could be slow to boot-up, but the bigger issue was the time and difficulty experienced by students in logging on to the wireless network in order to access the shared materials on *MeTL*. Although Alex noted that this can often be due to the wireless connection quality and not *MeTL* itself, the use of *MeTL* does require the connection. Network issues wasted time, with students having to make several attempts to log in, and Shaminka commented that when it came to facilitating her *MeTL* PASS sessions, at the beginning she felt that too much of her time was spent more in helping students learn how to use *MeTL* and deal with network issues. Alex reported that poor network connections could also impact on the effectiveness of collaborative activities. Occasionally, when *MeTL* was in 'collaboration enabled mode', some students were not able to edit, while due to small delays in connection, student notes and markings could be drawn over by others and the shared *MeTL* screen would quickly become cluttered.

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Leaders also reported the wireless network dropping out occasionally on individual machines during sessions, causing further frustration. To get around the slow login to *MeTL*, Alex would boot-up the Tablet PCs before the start of his session, login to *MeTL* then put the Tablet PCs into sleep mode. Once in the session, the students could simply open and wake the Tablet PCs with *MeTL* ready to go. For Leaders and students, there was a technical learning curve in using the Tablet PCs and accessing *MeTL*, but all three Leaders commented that as the semester progressed, so the technical issues diminished. Nevertheless, on the issue of the most appropriate ratio of students per Tablet PC, Shaminka noted that with a fewer number of Tablet PCs in the room, the impact of even one freezing during a session would become more serious than if the students had, for example, one Tablet PC per pair.

There was also a learning curve for the Leaders in how to use *MeTL* in their PASS sessions. The possibility of technical difficulties and the initial lack of familiarity with *MeTL* impacted on the amount of preparation required of Leaders before their sessions. For Shaminka, using *MeTL* did require more preparation, as, on top of preparing paper handouts in case of technical difficulties, time had to be spent setting up the program with appropriate questions and activities for use in class. Alex overcame his *MeTL* learning curve by having practice "mock up" sessions with another IT PASS Leader, preparing his sessions and practising running them beforehand.

For the first year students, too, it took time to become familiar with how to use *MeTL*. Yijun noted that for the first few sessions, students had no idea how to use the software, which wasted a lot of time, and recommended that the first year students be given more formal training in how to use – and take full advantage of – the *MeTL* software. Further, Yijun reported that some students seemed to feel uncomfortable using the Tablet PCs. His solution was to ensure that there was one student in each group who had good computer literacy, so that that student was able to help enter information from the group discussion into *MeTL*. Thus, those students less comfortable with computers were not disadvantaged in the *MeTL* PASS sessions.

Alex also reflected on the impact on students of the initial difficulties they had becoming accustomed to the software and its basic functions. Upon encountering issues with the software, some students would become disgruntled and less willing to reattempt or participate as actively in the *MeTL* activity. The technical difficulties put some students in defensive mode where they no longer offered 100% attention to the software and its use, instead moving the focus back onto the Leader. Some students seemed sceptical of the value of using the Tablet PCs and *MeTL* for activities such as writing program code, preferring instead more traditional interaction with their peers and their leader in discussing paper-based activities.

The final student-related issue to arise from the PASS *MeTL* trial was reported by Shaminka: that students occasionally misused *MeTL*, such as by drawing irrelevant pictures in the middle of an activity that could be seen on the screen, in order to elicit a response from the rest of the class. This was not an issue that came up very often, but it proved disrupting when it did.

Benefits (1): Student engagement – a new way of studying

Alex reflected on the positive impact of using the new technology, reporting that *MeTL* significantly increased participation and engagement. Having spoken at length to a number of his students who regularly attended *MeTL* PASS sessions, he found that they often simply wanted an alternative method of study. Using *MeTL* has given them a new perspective on studying the material. IT students are, of course, well-used to computer-based assessment. However, the flexibility and more informal learning atmosphere of PASS, in combination with the 'fun' thought-provoking quizzes created by the PASS Leaders and delivered via an interactive touch screen platform such as *MeTL*, fostered student participation and engagement. Filling in the blanks and completing tables of information are common activities in IT PASS sessions, and Alex discovered that his students were more willing to annotate a slide or fill out a table

electronically than when asked to do the same tasks on paper. There seemed to be an eagerness to 'get it done' if the content is given and run on a screen.

Alex made the point that students who participated actively in non-*MeTL* PASS sessions still participated actively in *MeTL* sessions, and those who actively sought advanced challenges still sought them in *MeTL* sessions. However the introduction of *MeTL* increased the alertness and interest of those students who had not previously been as interested in the PASS session content. Thus, Alex suggested that while *MeTL* did not have a huge impact or cause major change in the learning behaviours of already highly engaged students, it did increase engagement amongst students previously less engaged.

While the Leaders believed the different features of *MeTL* would appeal to the full spectrum of preferred learning styles (Fleming & Mills, 1992), both Alex and Shaminka emphasised the obvious appeal to more visual learners, as well as the tactile 'hands on' appeal of using the Tablet PCs to more kinaesthetic learners. Shaminka suggested that *MeTL* was a program that has the capacity to engage with a learner of any type, the only limit was the imagination of the Leader dreaming up activities.

All three Leaders emphasised the benefit to students of being able to take home softcopy notes (as screen captures) of all the *MeTL* activities, giving them a complete overview of every detail of the session they could review later in their own time.

Shaminka reported that having internet access during her PASS sessions was useful as students could instantly access lecture notes and view any YouTube videos she recommended.

Benefits (2): Time efficiencies

All three Leaders reported significant time savings in their sessions through using *MeTL*. Shaminka stated that the use of *MeTL* in the classroom undoubtedly changed how time was used. In the past, using a whiteboard meant that time was wasted when students wrote up their answers. In a far from ideal classroom crowded with desks and chairs, time was wasted simply getting to the whiteboard. Then, of course, other students would want to copy down the notes before any new information could be written on the board. *MeTL* removed many of these problems by providing real time access to answers from different students. Without leaving their seats, students could write up answers that were projected on a screen, and saved by students, ensuring the efficient transfer of information.

Similarly, Yijun noted that as a PASS leader for Organic Chemistry, his sessions involved a significant amount of drawing of complex reaction mechanisms and chemical structures. In a traditional session, a lot of time was wasted in the Leader drawing the initial diagrams on the whiteboard followed by students illustrating their worked solutions. It was easy for students to draw molecular structures and the steps of a chemical reaction on *MeTL*, with answers shared instantly. Once students became better at using *MeTL*, Yijun started to see its power, estimating a 20% increase in session efficiency.

Alex, too, reported that *MeTL* did save some time, due to the nature of soft-copy onscreen viewing and editing, as well as allowing activities such as quizzes to be implemented more efficiently than in a traditional PASS session. The nature of the IT discipline often requires long sections of programming code to be written and edited during a session. In this regard *MeTL* proved very useful. It catered for and increased efficiency when debugging (analysing program blocks of programming code for errors) by enabling students to view, edit and highlight information quickly on the *MeTL* whiteboard.

Yijun noted that *MeTL* enabled him to monitor his students more efficiently, as he could see their work on his own Tablet PC. Being able to target his support for

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students more effectively as they worked on tasks made his PASS sessions flow more smoothly.

Finally, while the threat of technical glitches meant that Shaminka preferred to take hard-copies of activities into her sessions as a back-up, Yijun noted that loading worksheets onto *MeTL* in advance did save the Leader from having to print and photocopy activity sheets.

Benefits (3): Increased student collaboration

Student-centred collaborative learning is the foundation of PASS, and all three Leaders commented extensively on the impact of *MeTL*. Shaminka observed that when working with first year students, inevitably in the first few weeks they can often feel awkward about working with other students. Sharing a Tablet PC was an effective way of encouraging group work. It was especially useful in groups where a scribe had to be nominated and students had to agree on answers to questions before presenting their answers. Certainly, no student could sit passively and there was always something to do. Even shy students could contribute in smaller groups, thus increasing participation. Further, once students were accustomed to using *MeTL*, they became used to the idea of presenting answers to questions to the whole group and being able to do this from their seats seemed less confronting than standing at the whiteboard.

Alex, too, noted that limiting the number of Tablet PCs in each session forced collaboration in a way, as students had to interact in small groups to complete activities and maximize the benefit from a session.

Yijun contrasted his experience with *MeTL* to that of the paper-based small-group activities he had run previously, where although students were given time for group discussion and were encouraged to solve the problems as a group, most students tended to work individually as each wanted to have their own copy of the notes at the end of the session. Knowing that electronic notes were easily obtained from *MeTL* for reference after the session, students were free to take a more cooperative approach. Again, having to share a Tablet PC encouraged group discussions.

The question of how best to use the Tablet PCs to encourage effective small-group collaboration led the three leaders to consider on the optimal ratio of students per computer. Alex reported that in his experience, the level of collaboration depended completely on the number of Tablet PCs issued. If one Tablet was issued to each student, zero group work occurred. *MeTL* would have still encouraged group work if, for example, the Leader assigned a *MeTL* slide to a group of students. The 'collaboration enabled mode' would allow all students to edit the slide, after which a recap and review of each group's slide would occur. However, *MeTL* was more effective at encouraging group work when using a Tablet PC shared between two students. Students participated in quizzes together and additional discussion occurred between student groups on issues presented via *MeTL*. Alex also noted that the Tablet PC itself impacts on the recommended ratio. The Tablet PC must be sufficiently large to allow comfortable viewing of *MeTL* slides and touch screen input from two people. The small screen size of the Tablet PCs used in the PASS *MeTL* trial was a problem in this regard.

For Shaminka, a key consideration was the nature of the activity students were being asked to complete. While it would certainly be possible to work with a larger student to Tablet PC ratio, because of her regular use of quizzes and polls, Shaminka's recommendation was one Tablet PC per student, or per pair. For her, one of the biggest advantages of *MeTL* was allowing students to vote on answers to questions. While she encouraged small-group discussion on responses, having one Tablet PC per student or one between two allowed each student to have their say. Further, especially during group work, a lot of time was saved by allowing more than one member of a group to write up their answers at once. This would not be possible with only one Tablet PC per group. Conversely, Yijun argued that three students per tablet computer is the best, with one student controlling the computer, two students sit on both sides.

All three Leaders commented on the potential of *MeTL* to make their sessions more visual. The Tablet PCs were great for mind maps, drawing and labelling diagrams, creating flowcharts and tables, and showing relationships between entities, such as matching words with definitions. In addition to sharing answers, Yijun noted the value of being able to instantly share students' workings. Discussing the process of reaching an answer is an important 'how-to-learn' strategy in PASS.

Shaminka gave an example of how she asked students to use *MeTL* to answer a series of questions on a given topic. In small groups, students would write down everything they knew about the answer to one of the questions, writing in *MeTL* in a designated colour. Groups would then switch questions with another group and fill any gaps in the answers using a different colour, referring to lecture notes or the textbook if necessary. Questions were rotated and further information added until the answers were complete and were then shared with the whole group. Alex, too, would ask small groups to rotate slides with sections of programming code amongst each other, enabling collaborative highlighting, commenting and note taking, before coming together as a whole group to compare ideas on the big screen.

Yijun observed that using the Tablet PCs actually lessened the likelihood of small-group discussion being dominated by an individual student. In small-group work based around hard-copy worksheets, it was too often the case that one student would do all the talking, giving a mini-lecture, with the others just writing down what he/she said. With students having to enter single, combined answers into *MeTL*, they tended to discuss ideas more. In groups of three or four students per Tablet PC, one student would type or draw answers on the computer, leaving the other members to discuss the answers. Groups usually shared the role of scribe between members.

Benefits (4): Quizzes

The quiz feature of *MeTL* proved universally popular amongst the participating PASS Leaders, and Alex's feedback that he used it in every session was typical. The Leaders noted how quick and easy it was to create true/false and multiple-choice questions on *MeTL*, and reported a wide variety of uses in their PASS sessions. Quizzes were found to be a good way to break up a session, serving as quick but productive time-outs from the main activities in the session.

Shaminka emphasised the value of pre-prepared content-based quiz questions as extension activities that could stretch stronger students, useful to keep all groups active at any given time. Faster groups could start discussing answers to quiz questions while slower groups catch up with other activities. Being able to create questions that followed the structure used in the final examination, Alex noted how his students were keener to participate as they could see clearly the benefit of practising such multiple-choice type questions. In debating their answers to exam-style multiple-choice questions, Shaminka emphasised the 'learning how to learn' value to the first year students of discussing strategies for how to tackle exam questions.

The ease of building quizzes allowed the Leaders to also create simple true/ false or multiple-choice questions *during* the session to highlight the difference between important aspects of a given topic, giving the Leader immediate feedback on whether students had understood the point or not.

Of particular importance to the PASS Leaders was that students were able to complete the quizzes in minimal time and anonymously – with the cumulative results available instantly, again providing students with immediate feedback as to how they are going in comparison to the rest of the class. Shaminka noted that this could not be done in such an anonymous and efficient way in the traditional PASS setting.

Shaminka also used the *MeTL* quizzes to poll her students at different points in the semester on their academic needs, in the hope that the feedback gained would allow her to better cater to their needs in later PASS sessions. For example, in the session a week before she was going to focus on essay-writing skills, Shaminka polled students

to find out what how much of their essay they had completed, allowing her to gauge what her students needed to focus on:

> Which of the following statements about the essay for BMS1021 applies to you?
>
> a. Essay? What essay?
> b. I've thought about it…
> c. I've read my starting references but haven't gone much further than that.
> d. I'm on track with getting the essay done.
> e. I've finished my essay.

One limitation of the quiz function was that only the Leader could create questions. A popular PASS activity across the disciplines is to ask students to work in groups to create quizzes to test each others' understanding of a topic, and Alex suggested that this would be a great feature to add to *MeTL*, adding to the list of activities Leaders could conduct in a PASS session.

CONCLUSIONS, LIMITATIONS AND NEXT STEPS

In its broadest sense, the trial of *MeTL* in PASS at Monash confirmed Koile and Singer's (2008) hypothesis, that a Tablet PC-based classroom interaction system would improve student learning. The *MeTL* trial was an exploration of ways to 'increase student participation, engagement and interactivity' (Kenney and Newcombe, 2011, p. 45). As is true of the roll-out of *MeTL* for in-class use at Monash, the trial of *MeTL* in PASS was predicated on a 'pedagogical, needs-based approach to evaluating, designing and deploying new technology' (Strong and Kidney, 2004, p. 64).

The trial, and this initial evaluation of it, was limited in scope. The number of Tablet PCs available to PASS was 24, and these were divided between three faculties and two campuses. This limited the number of PASS Leaders who could participate in the trial. The technical difficulties described earlier led to one of those Leaders withdrawing from the trial, while another could not use *MeTL* in one of his sessions because of the lack of a data projector.

The most significant limitation in this evaluation, of course, is that it includes the voice of the Leaders only, not that of their students. A key next step in the trial of *MeTL* in PASS at Monash will be to obtain specific feedback from participating students. One advantage the Leaders had in this reflective evaluation process is that they had each delivered non-*MeTL* PASS sessions for at least two semesters prior to using *MeTL*, so were able to reflect on the impact the technology had. The first year students will not be in this position: their experience will only be the *MeTL* PASS sessions.

A core purpose of the trial was to assess the useability and user experience of *MeTL*. As Neimeyer (2003) argued, the hope was to:

> make classroom technology as friendly and non-intimidating as possible. Technology should inspire presenters who rely on improvisation, spontaneity and audience participation (cited in Strong & Kidney, 2004, p. 66)

Improvisation, spontaneity and the ability to foster audience participation are, of course, key characteristics of PASS Leaders. It was essential to assess the value of *MeTL* from the perspective of the PASS Leaders, and from the reflections above, the clear conclusion was that there are definite benefits to PASS in using *MeTL* in terms of student engagement and collaboration, as well as time efficiencies.

As with the difficulties experienced by Leaders and students in the trial, many of the factors affecting the future expansion of the use of *MeTL* in PASS at Monash are technical. The PASS programs in the three disciplines involved in the trial – Biomedical Science, IT and Pharmacy – had been identified as being potential beneficiaries of *MeTL* in terms of the need for students in those disciplines to be able to present and discuss

large quantities of visual data, and so it was appropriate that those disciplines participated in the initial trial. However, there are many other PASS disciplines at Monash that also have clear potential to benefit from *MeTL*, including Anatomy, Engineering, Accounting and Finance, Art and Design, Film Studies, Law, and Physiotherapy.

While the provision of *MeTL*-equipped Tablet PCs to PASS Leaders and students avoided the equity issue of access to hardware, doing so is expensive, and will limit growth. Expanding the use of *MeTL* in PASS at Monash will be easier on the two largest campuses, where centrally located pools of Tablet PCs could – timetable permitting – be shared by different Leaders within and across disciplines. It will be less economical to purchase sets of Tablet PCs for use at smaller campuses where not all disciplines are represented, or supported by PASS.

There are still tutorial rooms at Monash that lack data projectors, and the availability to PASS of appropriately-equipped rooms will be another limitation on the use of *MeTL*. The occasional patchiness of the wireless network is another technical impediment beyond the control of the PASS Leaders.

MeTL training was also identified by the Leaders as an issue. While the Leaders participating in this trial were trained in using the software by eEducation, as *MeTL* becomes more widely used in the Monash PASS Program, so all commencing Leaders will need to be introduced to *MeTL* as part of their initial Leader training.

Similarly, consideration needs to be given to Yijun's recommendation that the first year students receive *MeTL* training in order to reduce the time lost in early PASS sessions as they find their way around *MeTL*. The training might also cover use of *MeTL* outside their PASS sessions, an issue raised by Shaminka. While access to the Tablet PCs was limited to the PASS sessions themselves, the first year students were able to download the *MeTL* software onto their own computers – allowing them to access the slides from their PASS sessions at home. However, feedback from the three PASS Leaders was that very few students took advantage of this, perhaps limiting the potential of *MeTL* to change student learning behaviours.

Despite these issues and challenges, the use of *MeTL* in PASS at Monash will continue to grow. Regardless of the fact that *MeTL* is not yet commercially available outside Monash, this trial has successfully demonstrated that an interactive Tablet-based system is not only practical for use by PASS Leaders and their first year students but can be a powerful tool in facilitating the PASS pedagogy of active, engaged and collaborative learning.

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