RHPF Southern REGIONAL HUB PROJECT FUND AKO AOTEAROA

Situated-technology –

Enhanced learning through development of interactive etextbooks on net tablets

Selena Chan

Katrina Fisher

Peter Sauer

December 2011

CPIT CHRISTCHURCH POLYTECHNIC INSTITUTE OF TECHNOLOGY TE MĀTĀPUNA O TE MĀTAURAKA

AKO AOTEAROA NATIONAL CENTRE FOR TERTIARY TEACHING EXCELLENCE

An Ako Aotearoa publication.
This project output has been funded by Ako Aotearoa through the Regional Hub Project Fund.

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Acknowledgements:

Katrina, Peter and Selena would like to thank the following for assistance in completing this project.

- Ako Aotearoa Southern Hub for funding teaching release time for all of us to learn more about using technology with our students.
- CPIT Foundation for funding the purchase of the hardware used in this project.
- CPIT Information Technologies (IT) team for technical support.
- CPIT Learning Technologies Unit (LTU) for assistance with software issues, critical guidance and prompt support.
- The School of Food and Hospitality Restaurant, Wine and Bar teaching team and the Trades Innovation Institute's Automotive Engineering team, for their on-going support, collegial cooperation and patience.
- The barista/hospitality and automotive engineering students who participated in this project for their curiosity, cooperation, flexibility and willingness to share ideas.

Summary

This project studies the combination, inter-relationships and synergies of four pedagogical approaches to improve student engagement with learning. These are mobile learning; constructivist learning approaches, with contemporary emphasis in the form of connectivism; situated learning of skills in purpose-built workrooms and workshops mirroring 'real-world' practice environments; and multimodal and multi-literate user interactivity.
As described in this project, the interactions of the above four pedagogical approaches, lead to the development of 'situated-technology-enhanced learning' using the capabilities provided by net tablets in the form of ipad2s and Android operating system tablets. Of importance is the use of net tablets to encourage students to create their own etextbooks or eworkbooks by collecting, collating and annotating photos, videos and notes of their progressive skills and knowledge learning.

This project evaluated how to best deploy situated-technology-enhanced learning to provide for:

- increased student engagement in learning,
- encourage teaching and learning activities based on student-centred and student-generated learning approaches and
- develop capability in using technology to support student learning.

The overarching theme arising from the study was the need to enable students and staff to utilise technology for learning. An outcome of this project is the derivation of guidelines,

achieved through the project's participative action research approach, to assist other vocational education institutions to introduce net tablets into trades-based learning spaces.

Introduction

This project brings together two learning technologies, mobile learning (mlearning) and ebooks. Both of these are predicted to become main stream within educational settings in the next one to two years (Johnson et al., 2011). Net tablets, exampled by Apple ipads, are mobile tablet computers with wireless access to the internet. Education has only just begun to explore the capabilities and potential of these devices. The educational use of net tablets, coupled with a constructivist, student-centred learning approach holds great potential. However, although use of net tablets in education is still developmental, the deployment of net tablets into vocational education workshop learning environments, offers much promise for extending the original tenets of mobile learning – for just-in-time, available anywhere learning opportunities (Belshaw, 2011).

This project is a continuation of mobile learning projects undertaken at CPIT from 2005 to 2009 (Chan, 2011a; Chan, 2011b). Ubiquitous computing, using mobile hardware (in this case net tablets) and wireless internet access, creates conditions for enhancing student learning. This project studies the combination, inter-relationships and synergies of four pedagogical approaches to improve student engagement with learning. These are:

- mobile learning encompassed by the phase 'any-time, any-where' learning.
- constructivist learning approaches, with contemporary emphasis in the form of connectivism, encouraging learners to collect and reflect on progressive evidence of their learning.
- situated learning of skills in purpose-build workrooms and workshops mirroring 'real-world' practice environments and
- multimodal and multi-literate user interactivity affording the collection of learning 'artefacts' that match actual practice.

As described in this project, the synergy of the above four pedagogical approaches, leads to the development of what the authors call **'situated-technology-enhanced learning'**.
This project evaluates how to best deploy situated-technology-enhanced learning to:

- increase student engagement in learning,
- encourage teaching and learning activities based on student-centred and student-generated learning approaches and
- develop capability in using technology to support student learning.

The project team consisted of:

- Katrina Fisher – barista tutor in the School of Food and Hospitality

- Peter Sauer – automotive engineering tutor at the Trades Innovation Institute (TII)
- Selena Chan – project leader/researcher who is an educational developer from the Centre for Educational Development

The students involved in the project were:

- 14 Level 2 Restaurant, Wine and Bar students completing a one year full time programme.
- 14 Level 2 automotive students completing a six month full time programme.

Many of the above students are Youth Guarantees students who exited formalised schooling with no academic qualifications.

In addition, subsets of some of the learning activities were introduced to other courses to obtain a broader student perspective. These groups of student were:

- 12 Level 3 Restaurant, Wine and Bar students completing a one year full time programme and
- 16 Diploma in Hospitality students completing the second year of their programme.

Pedagogical approaches to the project

In this section, short overviews of the four pedagogical approaches that underpin this project are provided. These four approaches offer background information for the planning, deployment and evaluation of the project. Each of these is now briefly discussed.

Mobile learning

When compared to its antecedent, elearning, mobile learning or mlearning, has a relatively short history (Pachler, Bachmir & Cook, 2010). For the purposes of this project, mobile learning is defined as “learning that is facilitated and enhanced by the use of digital mobile devices that can be carried and used anywhere and anytime” (O’Connell & Smith, 2007 p. 3). The primary focuses through three phrases of mobile learning development have already occurred:

- Firstly, with devices, the range including mobile/smart phones, PDAs, personal digital media players (e.g. ePods, MP3 players), net books.
- Secondly, with opportunities to bring learning out of the classroom (e.g. fieldtrips, work with homeless/disadvantaged youth and workplace learning) and
- Thirdly and most recently, on the mobility of the learner (Pachler et al., 2010).

There are many advantages provided for the adoption of mobile learning to complement formal and informal learning. Tangible benefits (JISC, 2011) of relevance to this project include:

- Portability – allowing for anywhere, anytime learning
- Immediacy and ease of communication (including speech and data-sharing)
- Allowing data to be recorded and learning processes captured wherever they happen.
- Access to mentors, tutors and others while learners on-the-move through the use of mobile communications
- Bite-sized e-learning resources can be delivered to learners and are especially useful for basic skills or work-based learning.
- Abstract (representational) and concrete (environmentally-situated) knowledge can be integrated
- Peer-to-peer networks make learning more student-centred
- Promoting active learning
- Enabling new learning environments to be accessed
- Encouraging reflection in close proximity to the learning event
- Reducing technical barriers to e-learning (p. 6)

Additionally, critical factors for mobile learning to be successful include:

- Planning, acknowledging and supporting the level of pedagogical integration of the technology into the course criteria and assessment
- The lecturer modelling the pedagogical use of the tools
- Regular formative feedback from both lecturers and student peers
- Appropriate choice of mobile devices and software
- Initial and on-going technological and pedagogical support (Cochrane, 2010).

Therefore, an important consequence of mobile learning affordances includes the adoption of a clear pedagogical framework. In previous projects, learners were encouraged through various learning activities embedded into their learning programme, to generate their own content. For example, to record skill acquisition as it occurs using mobile phones, collating these on to social networking sites and presenting them as eportfolios to complete competency-based assessments of workplace-based learning (Chan, 2010a; Chan, 2010, b). This shifts some of the onus of content production for learning from teachers to learners, moving learners from being consumers of content to becoming generators/constructors of content. The next section discusses the learning theories of constructivism and its possible contemporary version, connectivism.

Constructivism and connectivism

Constructivism, as deployed in this project, is founded on Vygotsky's conceptualisation of learning as being both *cognitive and social* (Powell & Kalina, 2009). A subset of definitions of

mobile learning centre around prospects for constructivist learning approaches to be applied. An example is quoted from Sharples et al. (2007), defining mobile learning as “the processes (both personal and public) of coming to know through exploration and conversation across multiple contexts amongst people and interactive technologies” (p. 237). Siemens (2005) proposes the concept of connectivism as an adjunct to constructivist theories of learning. His argument is that social changes brought about by new technology, requires a rethink of existing learning theories. He proposes principles for connectivitism as:

- Learning and knowledge rests in diversity of opinions
- Learning is a process of connecting specialized nodes of information sources
- Learning may reside in non-human appliances
- Capacity to know more is more critical that what is currently known
- Nurturing and maintaining connections is needed to facilitate continual learning
- Currency (accurate, up to date knowledge) is the intent of all connectivist learning activities
- Decision-making is itself a learning process, choosing what to learn and the meaning of incoming information, is seen through the lens of shifting reality. What may be a right answer now, may be wrong tomorrow due to constantly altering information (ibid p.5).

Hence, combining mobile learning and connectivism provides opportunities for knowledge constructing which is relevant, up-to-date and applicable. The next section discusses the contribution of situated learning theory to this project.

Situated learning

Learning in realistic work environments, provides potential to leverage on the many advantages of situated learning. These include providing students with opportunities to:

- learn how to apply knowledge learnt in conditions mirroring real world application
- engage in invention and problem solving pertinent to specialised contexts
- see and experience first-hand the implications of the knowledge learnt
- provide support as they learn (Collins, 1988).

Mobile learning complements situated learning through the just-in-time, when needed access to information. Ready access supports scaffolding or confirmation of ‘new’ learning, along with the ability to capture learning moments as they take place. The artefacts (i.e. evidence of learning) collected can then be viewed in formalised sessions or when the

student is ready, for further reflection and learning. This concept can be summarised as 'from learning as content to learning as context' (Pachler et al., 2010).

Of note to this project is the aspect of embedding literacy and numeracy through situated learning of a specialised vocabulary required to become trade practitioners. For automotive students, activities using net tablets assist with remembering, naming and writing the names of various car components. For barista students, there is a need to learn the spelling and characteristics of a large variety of coffee beans, coffee types and their associated serving containers. Many of the specialist terms used by barista have non-English roots and require students to learn how to spell long and unfamiliar words. However, as discussed in the next section, trade- based learning involves many non-text-based literacies.

Multi-modality and multiliteracy

The rapid advance of mobile device and software capability means access to content is no longer dependent on text. The New London Group (1996) recommends that approaches to teaching and learning, should recognise the emergence and importance of multiliteracies to include not only reading and writing but also:

- Visual literacies for working with images, page layouts, screen formats
- Audio modalities to understand music, sound effects and vocal presentations
- Gestural modalities to obtain meaning from non-vocal communications
- Spatial literacies to utilise environmental and architectural spaces.

The above forms of expressing understanding through non-text-based methods are especially pertinent to vocational and trades-based learning. Much of learning a trade or craft is involves apprenticeship, guided learning and workplace-based learning. As such, the literacies required are situated in practice. Much skill-based learning is hands-on, skill-and practice-centred and requires learning by modelling/imitation, initial guided practice, deliberate and repetitive practice, leading to eventual competency. The products of this learning are not text-based but in the form of manufactured products, completion of tasks or customer interactions. Hence, evidence of learning in the form of products, videos of students performing a skill or feedback from customers, is appropriate.

Towards situated-technology-enhanced learning

As a summary, this section rationalises the inter-relations between each of the four pedagogical approaches s discussed briefly in the above sections. The use of technology to

help improve learning (Scardamalia & Bereiter, 1994) is not new. However, net tablets and other forms of mobile hardware represent new ways to improve vocational learning opportunities. Mobile hardware allows the introduction of technology-enhanced learning to be situated in craft or trade practice contexts. Mobile technology can be used to provide learners with access to content. However, a more pedagogically appropriate approach is to harness technology to:

- encourage, inspire and empower learners to create their own content,
- track/trace and record learning as it takes place and
- use the created content to meet assessment requirements.

Therefore, the deployment of 'situated-technology-enhanced learning', as described in this project, can be used to apply constructivist/connectivist learning theories, to engage students in learning. Situated-technology-enhanced learning is also able to embrace the range of multiliteracies, used to learn and apply specialised skills. In bringing together the advantages presented by mobile/ internet technology to capture, collate and showcase multimodal skills and multiliteracies, specific aspects of trade students' learning are improved.

Project rationale

In this section the various aspects of the project are introduced. Firstly, the need to meet student needs is presented, secondly the capabilities of net tables (mobility, usability and multiple uses including the hardware and software) are explored, and lastly, extending the use of ebooks in education is discussed.

Meeting student needs

Previous research on mlearning at CPIT (Chan, 2011b) has revealed a digital divide amongst vocational learners who are often presumed to be 'digital natives' (Prensky, 2001). The concept of 'digital natives' has also been largely accepted by educationalists as a means to support the introduction of technology enhanced learning into school and post-school systems (Bennett, Maton & Kervin, 2008). However, findings from this and previous projects on students enrolled in trades courses at CPIT have found trades students to be confident with mobile devices (e.g. mobile phones, game consoles) but unfamiliar with using desk-top personal computers running on a Windows operating system (OS). Net tablets, with their touch and user-friendly control interface, are easier to learn to use and operate. Hence, it seems prudent to provide students access to technology beyond leisure applications, and to extend into study activities thereby enhancing students' digital literacies.

Net tablet capabilities

The specifications of each of the net tablets used in this project are detailed in Appendix 1 (for the ipad2) and 2 (for Toshiba Thrive tablets). Advantages and disadvantages of the two types of hardware selected for this project, the ipad2 running on iOS and the Toshiba Thrive tablet on the open source Android OS, are summarised in Appendix 3. The capabilities of net tablets, as they are utilised in this project are now discussed.

Mobility

The most obvious advantage of net tablets is their mobility. With net tablets, users are no longer tethered to a plug-in power supply or internet connection. Users are able to surf the internet via wireless local network providing for anytime, anywhere access. WiFi (wireless fidelity) access connects mobile and wired devices (computers, laptops, mobile devices) through wireless access points or hotspots. The advantage of this form of mobility, in vocational education contexts, is the potential to use net tablets in workshops and workrooms, set up to simulate real-world work situations. This means students are able to access technology enhanced learning without having to leave workrooms/workshops and be re-introduced to the unfamiliar learning environment of a computer suite. Due to their layout, computer suites are also not the best learning environments. Computer screens often prevent ease of access to tutors and other students for collaborative group work and create a learning environment dictated by the static nature of the computer suite's layout (Moor, 2006).

The mobile nature of net tablets allows for students' and tutors' utilisation and access to technology supported learning in specialist training rooms. Formalised learning activities supported by net tablets include:

- The use of cameras on the net tablets to gather and collate evidence of learning. This capability to capture multimedia evidence of learning is a major focus for this project.

- Access to course resources which are interactive. Instead of a hard copy text book, an online reference resource for automotive engineering called CDX provides videos, photos/diagrams, text and revision quizzes.
- Ease of entry into the institutional learning management system and its archive of traditional and multimedia content, learning activities (including glossary, wikis) and revision (quizzes).

Possible access to reference material via the internet also opens up 'for the moment' learning events, helping to engage and encourage students to explore beyond the resources available in their current workrooms.

Usability

Although laptop, netbooks, personal digital assistants (PDAs) and mobile phones can also create mobile learning opportunities, net tablets have a major advantage. When compared to laptops and netbooks, net tablets

- Are much more user-friendly and intuitive to use.
- Have touch interfaces for input of responses. They often do not require keyboard input, or the need to learn how to use track pads or computer mouse.
- Have simpler navigation, through one to two level file storage and access systems.
- Have larger screens, a distinct advantage when compared to the smaller screens available on other mobile devices exampled by Personal Digital Assistants (PDAs) or Palm pilots, ipod touch and mobile phones.

Multiple uses

A key aspect of net tablets is that the hardware and software capabilities of net tablets can be leveraged to support a range of useful learning activities. Each of these is now discussed.

Hardware -

Specifications for the hardware of net tablets are improving rapidly. The standard net tablet is able to store at least 8 to 16 GB of memory. 8 GB of memory is sufficient to hold 1,750 songs, 10,000 digital photos or 10 hours of video (wiki answers, ny). Advanced microprocessors allow software to run seamlessly. In addition, net tablets have:

- Cameras – for both still and video image capture
- Microphones – to record audio notes
- Global positioning system (GPS) and compass
- Accelerometer and gyroscope
- connectivity through WIFI, mobile or bluetooth
- long battery life when compared to other mobile devices and laptops.

Software –

Software on net tablets, called apps, can be interfaced together to provide for various means of gathering learning evidence. Besides the apps described in the following section that are selected specifically for use in this project, there is also a range of useful generic apps suitable for use in any educational setting. These apps often come already uploaded on to net tablets. 'Out of the box' apps include:

- Calendar
- Contacts list
- Note taking
- Maps
- Video player
- Youtube connection
- Music player
- Audio recorder
- Email
- Web browser
- Photo gallery
- Calculator

Apps and their deployment in this project

The net tablets chosen for evaluation in this project run using different operating systems (OS) with the ipad2 running on the iOS and the Toshiba Thrive Tablets running on the open-source Android OS. Apps for both of these OS's are easily downloaded from the Apple app store (iOS) or the Android market (Android OS). Desktop research and evaluation of the thousands of apps available provided a selection of apps for use in this project. We were careful not use too many apps as the main objective of the project, was for students to be able to archive evidence of practice and on-going learning. The apps selected were therefore to collect, annotate and collate multimedia evidence and to archive these for eventual showcasing to other students or tutors for assessment purposes.

Apps for the Ipad2

The apps selected by the barista tutor, Katrina, for students to compile content on latte labs are:

- photoshop express (PS express) to edit photos,
- Pixitag lite to add captions/speech bubbles etc. to photos,

- Keynote (slideshow software and iOS version of powerpoint) to showcase students' learning
- imovie to edit video and
- neu-annotate, a pdf editor, to complete worksheets provided by tutor.

Also apps pertinent to barista including Latte Art, Aroma Coffee and Coffee Café were used, the last two are games help introduce students to using the ipad.
The full complement of apps used with the ipad2 are detailed in Appendix 5.

Apps for the Toshiba Thrive Tablet

Automotive engineering tutor, Peter, based his work around using the Toshiba Thrive camera/video and the presentation tool (called 'Show'). He also used the app picsay, to add captions/speech bubbles and highlight sections of photos.
The apps used with the Toshiba Thrive Tablet are detailed in Appendix 6.

Improving ebook utilisation

One of the major uses of net tablets, is to use them as ereaders. However, current ebooks/etextbooks are predominantly existing text resources, converted into static formats (exampled by .pdf) and uploaded for display on ereaders, net tablets and mobile phones. In contrast, this project sought to:

- create interactive etextbooks that have a large component of multi-media content supported by text.
- develop content appropriate to students' text literacy level and multiliteracies.
- display the student and tutor developed content in a form that enhances readability and engagement.

The development of interactive etextbooks is founded on principles of multiliteracies (New London Group, 1996), as an alternative to pre-dominant text-based content. Hence, the etextbooks students developed as part of this project, were not static learning resources but included student and tutor generated learning objects, quizzes and activities.
The net tablets and supporting pedagogical approaches used in this project encouraged students to create learning content. These were in the form of written notes, diagrams, photos, videos and voice recordings. Therefore, aspects of 'constructivism' and 'eportfolio' compilation, leading to students constructing their own etextbooks/eworkbooks/dtextbooks/dworkbooks, were important project outcomes. This concept is generic and easily applicable to a wide range of vocational education disciplines.

Research method

Overview

In this project, listening to and making sense of the student voice was paramount. As learnt from previous mlearning projects (Chan, 2011a), careful consideration of student feedback assists with the production of user-friendly, appropriate and sound learning resources. Tutor expertise and feedback are also important in developing learning resources grounded in appropriate pedagogical approaches.

Therefore, the evaluative research process underpinning this project was participative action research, a critical-emancipist paradigm (Wadsworth, 2001) acknowledging contributions to meaning, practical knowledge and experience from students and the project team.

Participative action research

Several iterative cycles of participative action research (PAR) were undertaken to understand the perspectives of students and tutors as learning activities combined with the production of interactive etextbooks were deployed. These cycles of PAR include:

- planning the question for each step in the research process,
- carrying out the investigation and
- observing, evaluating, reflecting and making appropriate adjustments before
- moving on to the next cycle (Reason & Bradbury, 2001; Wadsworth, 2001).

Student involvement included participation in 'critical incident' [1]*focus groups/questionnaires* as interactive etextbooks/eworkbooks were introduced, personalised and utilised. Tutors maintained an on-going *electronic journal*, detailing the planning, deployment, construction of etextbooks and use through teaching sessions. The project leader/researcher used *classroom and workshop observations* to evaluate the efficacy of the cooperative learning environment afforded by the ability to upload content on to net tablets by both tutors and students. Evaluations were based on a typology to study interactions of individuals with net tablet, individuals with peers, group interaction with net tablet and tutor and student interaction (see Appendix 7).

[1]' Critical Incident' questionnaire is a learning evaluation technique. Students are asked to provide feedback on what engaged or disengaged them during a learning activity session and how they would like to see the activity improved. We used a modified classroom critical incident questionnaire (Brookfield, S. (n.d.) http://www.stephenbrookfield.com/Dr._Stephen_D._Brookfield/Critical_Incident_Questionnaire_files/CIQ.pdf

Data analysis

A constructivist-interpretivist approach was then used to distil guidelines for collating etextbooks, emerging from student interaction, tutor reflections and classroom observations. Data collection and analysis was informed by literature on the use of multimedia to enhance student learning (exampled by Mayer, 2003), activity theory (Engestrom, 2004), elearning design (for example Nichols, 2009) and multiliteracies (New London Group, 1996).

Findings

Using net tablets

In this section, a brief description is provided of how students were introduced to the use of net tablets in their workroom/workshop and the learning activities they undertook as part of this project.
Note that the findings from this project are derived from studying students engaged in two specialist fields, automotive mechanical engineering and barista (espresso preparation).

Evaluation of apps

In the main we found Ipad2 apps to be sound. The free Android OS apps we used had to be vigorously tested and some initial apps were found to be unstable. Fortunately, we did not have to download many Android OS apps as the Toshiba Thrive tablets had suitable apps already uploaded, including Windows compatible versions of word processor, excel and powerpoint.

Introducing students to the tablets

An important aspect of the project was to ensure that students were introduced to the use of net tablets for use in learning activities. Introductory activities included:

- using the camera on net tablets to take photos of fellow students, annotating or graphically enhancing these photos and using these to customise the opening screen of net tablets. This activity has two purposes, the first to introduce students to the touch interface and the second, to provide students with a means to identify the tablet they will use throughout the course.
- Games appropriate to the subject matter were also used to introduce students to the net tablet's capabilities and to be used as 'rewards' for completion of set learning activities.

Learning activities

The learning activities deployed with the net tablets, were linked to standard learning outcomes required in the two participating courses.

The net tablets were used to encourage students' contructivists/connectivist and situated learning and learning activities used to improve learning are now described.

Students' collection of their learning.

This approach took several forms.

- Photos of products made by students – example in barista would be the six types of coffee each student had to produce to complete assessment requirements. These are then used for future reference, to match the type of coffee with the types of utensils each coffee is to be served in.
- Photos used to help describe processes – example in barista is for students to use photos to describe the steps taken to form a design on top of their coffee and automotive students using annotated photos to describe the steps required for changing a tyre.
- Photos of objects – example in automotive of students completing a unit standard that requires them to locate car engine parts and to state the function of each part. Here students took photos of the engine, labelled and annotated the photos, uploaded these photos into a slide show and on each slide, detailed the function of each car engine part.
- Videos of processes – example in barista, to have another student video as students steamed milk. This process is often difficult to view due to the action and layout of the espresso machine. Groups of students would then be able to dissect the process. From this reflective peer-learning activity, students are encouraged to develop better metacognition of their learning process, develop shared understandings and improve learning (including less wastage of milk).

Bringing relevant text into the learning process

Net tablets were used to encourage students to improve text-based literacy by using the multi-media evidence collected in structured learning activities. Examples include:

- Using etext books – automotive students are able to use reference sources that feature interactive text, photos and videos.
- Taking and labelling photos of different types of coffee and including specialised forms of industry standard written communication in the form of abbreviations used to take coffee orders.

Using search engines appropriately

Net tablets and wifi were used to access the internet to research relevant topics. For example, restaurant, wine and bar studies students used the net tablets to

- complete a worksheet on environmental sustainability as it relates to the coffee industry
- find information on various coffee companies and to report to the rest of the class on the strategies used by each company to ensure their coffee was grown and sourced ethically
- find youtube videos that promoted coffee companies' sustainability goals.

Using the net tablets within the training workroom, provided the tutor with the opportunity to help students become more critical evaluators of search engine results, use search engines more effectively and efficiently, and discuss issues around search engine choices. In the past, the students would have embarked on this activity as out-of-class activity. They would have used desktop computers in the library either individually or in small groups to find the information required.

Developing etextbooks

The collation of student generated material as guided by tutors and as subsets of tutor generated material, was made possible through the affordances for mobile and situated-technology-enhanced learning. Students collected evidence of learning in the form of photos, videos and completion of worksheets. The learning evidence was then collated using slideshow software (keynote for ipad2 and show for Toshiba thrive tablets) and short movies (using imovie on the ipad2). This evidence was shared in class presentation sessions and feedback from tutors and students was then used to further improve learning. See examples of students' work in appendices 9 and 10.

Class observations

Class observations were undertaken with

- groups of automotive students working in the automotive workshop,
- Automotive students in classroom settings and
- hospitality students learning in a specialised barista workroom.

Observations were made of class activities using and without using net tablets.

The findings from the classroom observations reveal the following:

- Class organisation – This occurred mostly with students working together on small group activities. There were several observations where students were working

individually with the net tablets. For example, when students collected evidence of their understanding of individual car engine parts, each student collected their own photos, annotated their own photos and presented the labelled photos to other students.

- Teachers' role – tutors often took on a coach and facilitator role. In barista, the tutor was observed to prepare students for using the ipads in learning activities with a demonstration and modelling of how to use the hardware, the apps and an example of what was expected.
- Student creation of artefacts – the camera was used for many of the learning activities. Videos were used to record some student activities and these videos were then used to help students spot mistakes, enhance accuracy, speed or application and hone skills, and compile a record of work processes. Students also use apps that allowed the annotation (addition of text, photos, sketches) to pre-uploaded pdf worksheets.
- Student use of content – hand outs were still used but these could be transferred on to net tablets. Students used the wifi feature on the tablets to find out more information about topics introduced or discussed in workshop/classroom sessions.
- Students' level of digital literacy – most students required minimal introduction to begin using the net tablets. A few students with very low digital literacy skills were able to complete initial learning activities on the net tablets with assistance from tutor and peers. For students who had not used any computers before, confidence in using the net tablets was established after using the net tablets for just one learning activity.
- Content level – The programmes/courses the net tablets were used in were level 2 and 3. Therefore, most of the learning outcomes were to remember, understand and apply new information.
- Curriculum fit – Care was taken to ensure that learning activities matched learning outcomes. Photos or videos collected were used to add to students' learning about specialised processes, tools, equipment and ingredients. For many of the students involved in this project, completion of learning activities in the automotive or barista sessions, were the first time they had encountered industry specific jargon and specialised content.
- Level of technology integration – appropriateness of the level of technology integration was also important. Learning activities were focused on meeting learning outcomes established for each session and not for the purposes of using technology

tools. As such, the net tablets were used in specific/targeted learning sessions and were not made available to students outside of these time periods.

- Student engagement – high student engagement was observed throughout all the activities involving the use of net tablets. Students stayed on task, contributed ideas towards the improved use of net tablets for learning activities and completed complex manipulation of visual and text elements to meet learning outcomes.

Student feedback

Student feedback was gathered through informal conversations and completion of 'critical incident' reports. Student feedback was to establish student engagement and the feasibility for using the net tablets in both the barista workroom and the automotive engineering workshops. An example of a written evaluation sheet is found in Appendix 7.
From these we established the following:

- 80% of the students were interested in using net tablets as part of their learning activities for at least 80% of their class time.
- All the students found the tutors 'getting started' presentations useful, with most finding the presentations to be very useful.

Comments from students include:
"I think they are a very helpful too and get students involved."
"further use of these will proberally (sic) get student very excited"
"very easy and cool and amazing"
"it was fun and doesn't need any more to improve it"
"It was interesting and fun"
"more apps on ipad"

Tutor reflections

Tutor reflections on teaching, as gathered in reflective journals, were thematically analysed and summarised. These themes were consolidated and form the foundation of the items for discussion and the formulation of the guidelines presented below. Peter's summative reflections are attached in appendix 8.

Researcher reflections

Researcher reflections revolved around a synthesis of the data gathered through the workroom/workshop observations, conversations with tutors and students and interpretation of the literature pertinent to the project. The focus was to undertake a reflective process to

appraise the connections between the literature reported above in this report and the following discussion section.

Discussion

Enabling tutors, students and then technology

This project was initiated to ensure students and tutors were empowered to become involved with and contribute to the effectiveness of using net tablets and their accompanying apps, as learning tools. To achieve this, we had to ensure that students

- were carefully introduced to the net tablets
- participated in net tablet-based learning activities as tutors worked with them
- were encouraged to provide feedback as net tablets were introduced and used
- were scaffolded to produce evidence of their learning that reflected their personal learning goals and affinities.

In turn, the tutors had to

- commit to a period of time to work through various hardware and software related complexities
- attain confidence in using a new piece of technology before they were used with a class,
- adapt learning activities to include the appropriate use of net tablets
- maintain flexibility with lesson plans as learning sessions evolved
- listen to student feedback to improve on the next iteration of the learning activity.

Therefore, as summarised in Figure 1 below, the focus in this project has been to ENABLE STUDENTS and ENABLE TUTORS to be able to maximise the learning potential of net tablets, BEFORE using the technology to ENABLE and ENHANCE LEARNING.

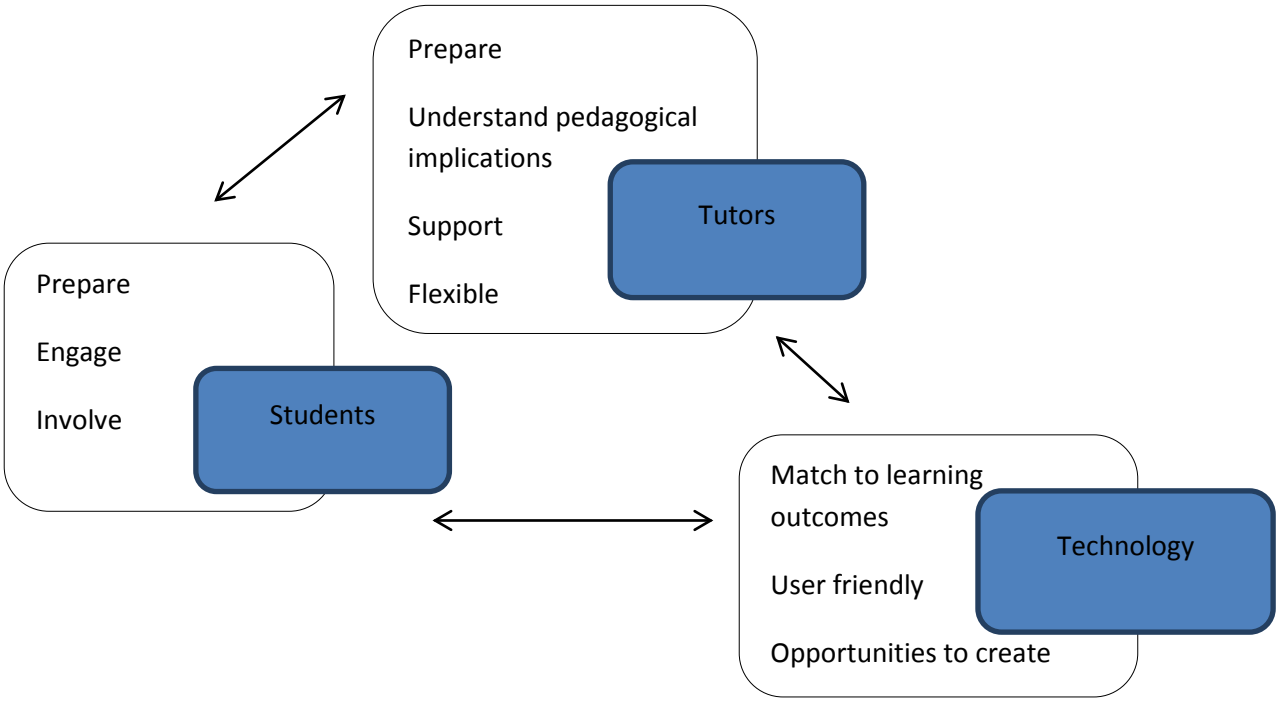


Figure 1: Enabling students, enabling tutors, before enabling technology

Situated-technology- enhanced learning

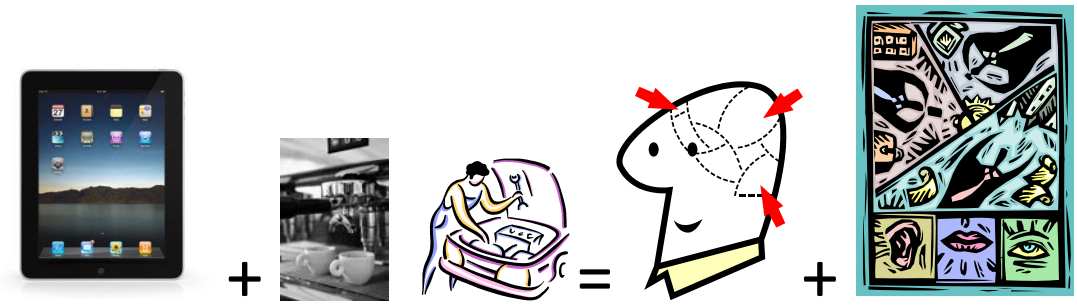
Using net tablets in workshops /training rooms provided the opportunity to use mobile learning activities with students learning a specialist trade skill. The students participating in this project were completing level 2 pre-employment programmes. Many had left school without completing National Certificate in Education (NCEA) qualifications. Many of these students had low literacy and numeracy scores as provided through the Assessment for Literacy and Numeracy (ALN) tests at the beginning of the programme. Several learning activity sessions observed students struggling with aspects of spelling.

The non-text-based means of expressing students' learning (videos or photos of their work) through engagement and practice afforded prospects for showcasing skill attainment. The collection of multimedia learning evidence could have been accomplished using digital cameras and standard desktop computers. However, the

- mobility of the net tablets,
- easy to use interface
- selection of appropriate learning activities
- use of carefully chosen apps to achieve learning outcomes,

provided opportunities for instant capture of learners' *personally important learning moments* as and when it occurred. The collection of evidence of learning that held significance for the learner is therefore, a valuable outcome of situated-technology-enhanced learning.

The situated-technology-enhanced learning concept, as described in this project, would not be possible without each of the precepts of mobile learning (with the net tablet as a well matched technological tool) and situated learning environments (in the form of learning environments that replicate real-world workplaces), being present. Both these precepts can be leveraged to encourage participative student learning (constructivism/connectivism) that are congruent and empathetic of students' and vocational education disciplinary multiliteracy/multimodal perspectives. These inter-relations between technology and pedagogy are summarised in Figure 2.



Technology + situated learning environment = constructive/connectivist learning + multiliteracy/multimodal learning

Figure 2: Situated-technology-enhanced learning

The guidelines

In this section, the guidelines for the introduction of net tablets into vocational education contexts to utilise the advantages for situated-technology enhanced learning are presented and discussed. These guidelines are derived from the themes discussed in the above section on enabling students and tutors; then applying the affordances provided through situated-technology-enhanced learning.

Preparing tutors and students

Preparing tutors

Prior to the beginning of this project, both barista tutor, Katrina, and automotive engineering tutor, Peter, were conversant and confident with the use of technology. However, an extensive fortnight was still required for both to study the capabilities of the net tablets. Much time was also dedicated by the researcher and tutors, to explore 'app stores/markets' for

suitable apps. As one of the projects' primary goals was to develop 'constructivist/connectivist' situated learning activities for vocational learners, it was important to find apps that would allow students to easily create, archive, collate and showcase content. We found, evaluated and tested dozens of apps.

Both tutors also undertook to develop 'how to' guides, modelling the types of content the students would also develop, to help students learn how to use the net tablets and apps. The process of preparing the guides provided tutors with

- The opportunity to 'learn by doing' as building the 'how to' guides meant tutors had to become conversant with each apps' features.
- Checkpoints on the viability of the learning activity. If it was difficult to prepare a short 'how to guide', the activity would perhaps be too complex for students to undertake.
- Undertaking an evaluation of various possible methods for constructing and disseminating multimedia information on net tablets. As a consequence, the decision was made to use slideshow platforms (Keynote on the ipad2 and Show on the Toshiba Thrive) for students to construct etextbooks.

The important criteria were to ensure technology was used to assist learning and not to overwhelm the actual learning outcome of learning sessions.

Guidelines from this section include:

- Underpin learning activities with sound pedagogical frameworks.
- Set aside sufficient time for tutors to familiarise themselves with the technology.
- Encourage tutors to 'learn by doing' and to explore the distinct ways technology may be used to assist learning of a specialist discipline/craft skill.
- Tutors prepare 'how to guides' as a precursor to using the activities with students.

Preparing students

We did not assume that all students involved in the project would have pre-requisite digital literacy skills. We offered guidance to students who might be intimidated by the introduction of technology into their learning environment. Additionally, we also learnt much from students who were interested in technology and were already making extensive use of mobile technology (mobile phones and games consoles) for their leisure activities. We obtained valuable feedback from students of the:

- Value and relevance to their learning through participation in learning activities using net tablets.

- Helpfulness, practicality and comprehension of the ‘how to’ guides.
- Usability of the net tablets.
- Integration of the use of net tablets to students’ learning needs.
- Other potential uses of net tablets they were interested in exploring.

Guidelines from this section are:

- Support students to develop appropriate digital literacy skills for using apps specifically for learning.
- Explain to students, the reasons for using technology in learning activities.
- Encourage students to contribute to improvement in how net tablets are used for meeting learning outcomes.

Selecting appropriate learning activities

Matching technology to meeting learning outcomes

An important principle adopted at the start of this project, was to match the use of technology to appropriate learning outcomes. The project team discussed the viability of various approaches and worked hard to prepare introductory material for students. As students engaged with situated-technology-enhanced learning activities, their comments and feedback were collected as a form of evaluation on the appropriate match between the use of technology to learning outcomes.

In summary, we found the following to be useful strategies.

- Check learning outcome to find out level of learning required (i.e. remember new information, understand a concept, apply theory to practice, practice a skill etc.)
- Use appropriate technology-based activity for each level (e.g. to remember new information-*take photo of item to remember and label*; understand concept-*summarise initial understanding on note pad, revisit as understanding increases and rework summary*; apply theory to practice-*take photo of product and evaluate each to identify processes that need to be improved*; practice skill-*take video of each iteration of skill and use this video as a platform for feedback from peer, tutor and self to improve practice*).
- Try learning activities out with volunteers to establish timing, pace and extend before piloting with students.

The guidelines from this section are:

- Match learning activity to learning outcome.
- Pilot learning activities with other tutors before using in class with students

Setting up learning activities

Introductions important

As prefaced above, it is important to introduce students to the technical aspects of using net tablets before they undertake net tablet assisted learning activities. By ensuring students were familiar with using the net tablets, the learning outcomes from situated-technology-enhanced learning are increased.

Students could consult their peers, the tutors or the 'how to' guides archived on the net tablets to complete learning activities. It was important to ensure students were not overly confused by the need to understand how to use the technology but were able to learn net tablet protocols quickly and become confident users.

Guidelines from this section are:

- Provide tutor support and student accessible support for each learning activity
- Encourage students to experiment and feedback on aspects they found difficult to follow
- Make the activity fun
- Encourage peer learning by pairing students who are confident with using technology with students who are less confident
- Identify students who are reluctant to engage with the technology quickly and offer assistance beyond the introductory activity
- Trial the 'how to' guides with other tutors or student volunteers

Using net tablets for learning activities

Build the use of net tablets into normal learning activities and introduce each learning activity carefully. In particular, tutors were very aware of the pedagogical implications of using situated-technology-enhanced learning. Our aim was to ensure students' engagement with the net tablets would not detract from their meeting learning outcomes. The wide range of activities deployed in this project required the scaffolding of students' digital literacy skills. Students were able to use the net tablets' still/video camera very quickly. However, almost all the student involved in this project had never annotated or edited photos or 'made a movie'. Student evaluations indicate students enjoyed producing content that was relevant to

their learning. The content they created showcased their emergent understanding and growing skills as they progressed through their course. Of note is the ability to share their slideshow or movie with other students, their tutors and their friends.

Guidelines for this section are:

- Integrate technology into learning activities seamlessly
- Brief students on the role of technology in the activity
- Scaffold students gradually from simple to complex digital skills
- Ensure activities provide extrinsic rewards for students in the form of a 'product'
- Remember, the use of technology is to enhance learning

Be prepared to be flexible

Due to disruptions, logistical re-organisation/re-timetabling and tutor availability brought about by the Christchurch earthquakes and snow storms, a degree of flexibility was worked into the timelines for various planned learning activities incorporating the use of net tablets. We were also aware of the need to work within the capabilities of the student groups involved in the project. Therefore, learning activities using the net tablets were re-adjusted slightly as they were introduced to students and as the students engaged with each learning activity.

Guidelines for this section are:

- Acquire sufficient capability to use net tablet so as to be flexible, if required, to change learning activities
- Listen and act on student feedback as learning activities progress to ensure students maintain focus on learning tasks
- Provide students with opportunities to learn additional digital skills so that they are able to provide constructive feedback for future use of technology to enhance learning

Conclusion

In this project, net tablets were used to provide opportunities for students to become constructive learners. To ensure success, tutors' technology capability, both individually and within the teaching sections involved in this project, required external support and tutors' enthusiasm and diligence. The advantages of situated-technology-enhanced learning in vocational learning settings can be used to engage and enhance learning and contribute to improvement in students' and tutors' digital literacy skills.

The findings from this project show an increase in student engagement brought about by a careful match of learning outcomes to the use of situated-technology- enhanced

learning. The four pedagogical approaches of mobile learning, constructivists learning, situated learning and encouragement of multimodal and multiliteracy modes to showcase students' work, were made possible through the capabilities of net tablets. The introduction of using net tablets in the ways described in the project, also led to tutors' increased understanding of teaching and learning processes. Additionally, the two teaching sections (barista and automotive engineering) involved in this project, reaped benefits from the on-going teaching methodology discussions and opportunities to trial and familiarise themselves with the net tablet's educational potential.

The guidelines provided in this project, are to assist vocational educators to implement situated-technology-enhanced learning into their programmes/courses. It is important to ensure there are structured and supported processes for introducing students and tutors to learning activities which are matched to appropriate technology tools and delivery. The approaches detailed in this report, ensure vocational students not only meet programme and qualification outcomes, but gain important digital literacy skills and become constructive learners.

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Wiki answers http://wiki.answers.com/Q/How_much_does_a_8gb_ipod_touch_hold#ixzz1ZNu21U6r

Appendices

Appendix 1 – Apple Ipad2 specifications

Dimensions L x B x H 241.2 x 185.7 x 8.8 mm Weight - 613 grams
- 607 g (Verizon variant) Form Factor Touchbar Tablet
Display Type back-lit LED Capacitive Touch Screen Size 9.7 inches Resolution 1024 x 768 Pixels WXGA 132 dpi pixel density
Input/ User Interface Multi Touch
Fingerprint/Scratch-resistant oleophobic surface
Accelerometer sensor for UI auto-rotate
Light-Sensor(Ambient)
3-axis Gyro
Full-screen zoom magnification
System Properties Operating System Apple iOS 4.3 CPU Apple Dual-core A5 1GHz Processor
9x GPU performance
Storage Capacity Internal Memory 16GB/ 32GB/ 64GB built-in memory Expandable Memory NO **Browser & Messaging** HTML, Safari Browser
MMS, SMS, Push Mail, Email
Camera Still (rear-side) - Yes
- 5x digital zoom
- Photo and video geotagging over Wi-Fi Secondary (front-side) - Yes Video Recording - Yes, Capable
- 720p HD Video Recording Capable @ 30 fps Video Calling - Yes
- FaceTime App Using Capability
Connectivity DATA GPRS, EDGE, HSDPA, HSUPA Bluetooth & USB v2.1 with EDR Stereo & v2.0 Headset 3.5mm stereo headset jack Radio NO HDMI out Yes WLAN Wi-Fi 802.11 b/g/n GPS A-GPS 3G Yes
EVDO rev.A HSDPA Up to 14.4 Mbps HSUPA Up to 2 Mbps
Video & Audio Video Formats MP3, WAV, M4A, AAC, eAAC, Apple Lossless, AIFF, Audible Audio Formats MPEG4, Motion JPG, MOV, H.264
Battery Type Li-Ion 6930 mAh Standard Battery Video Playback Time Up to 10 Hours Web Surfing Time Up to 9 hours (3G) Audio Playback Time Up to 40 Hours

Appendix 2 – Toshiba Thrive

Tablet specifications

CPU	nVIDIA Tegra™ 2 T250 (1GHz, 333MHZ FSB, 1MB L2 Cache)
Platform	Android™ 3.0 Honeycomb, Upgradeable to 3.1
Screen Size	10.1" Widescreen
Memory	Internal 1GB DDR2 RAM
Storage	eMMC 16GB
Graphics	NVIDIA GeForce Graphics
Audio	Headphone & MIC Combo
Speakers	Stereo Speakers with Custom Sound Enhancements
Webcam	5.0M (Out) 2.0M (In) w/MIC
Button	Power, Volume Up/Down, Screen rotation lock & back cover Lock
Sensors	Gyroscope, Accelerometer, Ambient Light Sensor, GPS, E-Compas
Standard Warranty*	1 Year limited parts and labour warranty
Security	Android™ Password protection.
Software	Android™ Market, Toshiba Market Place, Toshiba Media Player, TOSHIBA Resolution+™,,
USB Ports	2x USB Ports (1x USB 2.0 + 1x Mini USB 2.0)
HDMI	Yes
Weight (from)	0.73kg
Battery	23W-hr Prismatic Lithium Ion, User-replaceable
Dimensions (W x D x	273mm x 177mm x 15.8mm
Wireless Communication	PCIe-mini card Broadcom 11b/g/n
Integrated Bluetooth™	V2.1 + EDR (Enhanced Data Rate)

Appendix 3 – Comparison of two net tablets – for use in vocational education settings

Hardware

Criteria	Ipad 2	Toshiba Thrive Tablet
size	Slim, lighter	Heavier, bulky
feel	Smooth, easy to carry	Has a rubber 'textured-rib' patterned back, providing a non- slip back cover.
robustness	Might not survive if dropped on to a hard surface (we did not test this!)	Possibly not sustain too much damage if dropped on to a hard surface (not tested!)
screen	Screen is easier to clean	Screen smudges easily and more difficult to clean
External access	Through Wifi and use of cloud computing	Has USB, HDMI and mini USB ports and built-in SDHC card reader
battery	Fixed, replaceable only through dealer	Removable, replaceable on purchase of new battery

Operating systems

Criteria	iOS (Ipad2)	Android OS (Toshiba Thrive Tablet)
multimedia	Must have compatible file type to run	Runs multimedia Shockwave 'Flash' files
File	Some files can be brought across on some apps using itunes	File manager reads files on SD card or memory stick.
printing	Need to have a separate app to do this	Has print manager
Operating system	Closed – apps must be registered by Apple and purchased through Apple appstore/itunes	Open source
integration	With other iOS platforms -	With Google
consistency	User interface consistent across apps	User interface can be different between similar types of apps

Apps

Criteria	iOS (Ipad2)	Android OS (Toshiba Thrive Tablet)
'Out of the box' apps	Preloaded apps including utilities	Preloaded apps – including utilities, file manager and windows compatible versions of Word, Excel and Powerpoint.
stability	No noticeable bugs	Some apps are buggy and so all apps require careful evaluation before use.
selection	Very large selection – 65,000	Lower number available – 100s

Websites consulted for comparisons:

http://sanfrancisco.ibtimes.com/articles/177339/20110710/tablet-war-apple-ipad-2-toshiba-thrive-android-honeycomb-ios.htm#page1
http://wlbloguno.blogspot.com/2011/07/toshiba-thrive-review-best-alternative.html
http://www.thegeeksclub.com/apple-ipad-2-toshiba-thrive-detailed-tablets-comparison
http://www.slashgear.com/ios-apps-65000-vs-android-3-0-honeycomb-apps-at-100-02137192/

Appendix 4 - Interactive tablets - Class observation form

Course: _____ Course content: _____ Group/individual: _____ date: _____

	5	10	15	20	25	30	35	40	45	50	55	notes
Class organisation:												
Individual -												
Pairs -												
2-4 -												
Whole class -												
student-led -												
off task -												

	5	10	15	20	25	30	35	40	45	50	55	notes
Teacher's role :												
Whole group direction												
Interactive whole group												
Modelling whole group												
Facilitating/coaching												
Managing behaviour												
Administrative tasks												

	5	10	15	20	25	30	35	40	45	50	55	notes
Student creation of artefacts:												
Sketch												
Type												
Photos												
Audio												
Concept map												
off task -												
	5	10	15	20	25	30	35	40	45	50	55	notes
Student use of content:												
Web browser												
Handout												
CD												
Powerpoint												
video												
off task -												

Students' level of digital literacy:

Needs assistance □ competent □ tutor assistance □ peer assistance □ initiates ideas □

Content level:

Remember □ understand □ apply □ analyse □ evaluate □ create □

Curriculum Fit:

appropriate □ maybe □ no□

Level of technology integration - appropriateness

High □ medium □ low□

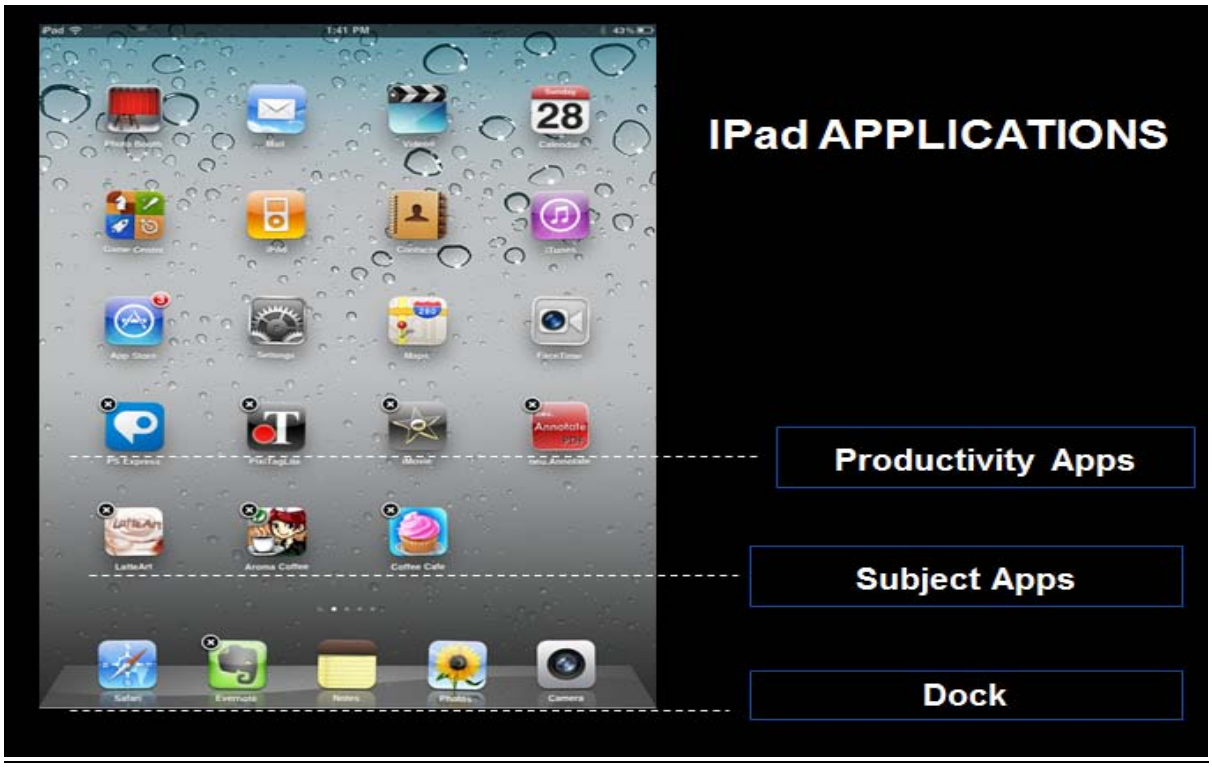
Student engagement

high □ medium □ low

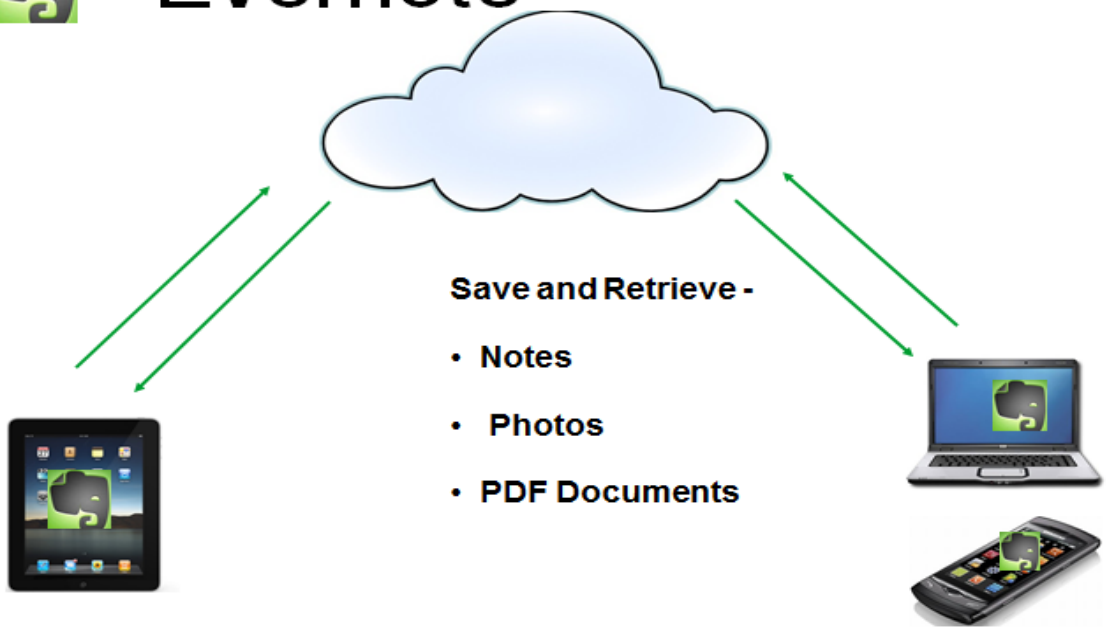
Notes:

Appendix 5 – Introductory handout/worksheet introducing student to use of net tablet in Barista workroom –

Produced on keynote



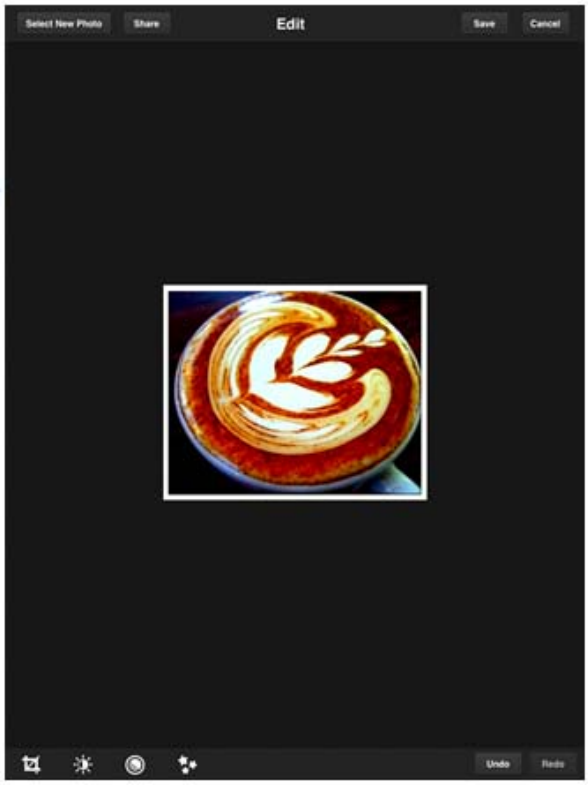
Evernote



Save and Retrieve -

- **Notes**
- **Photos**
- **PDF Documents**

PS Express

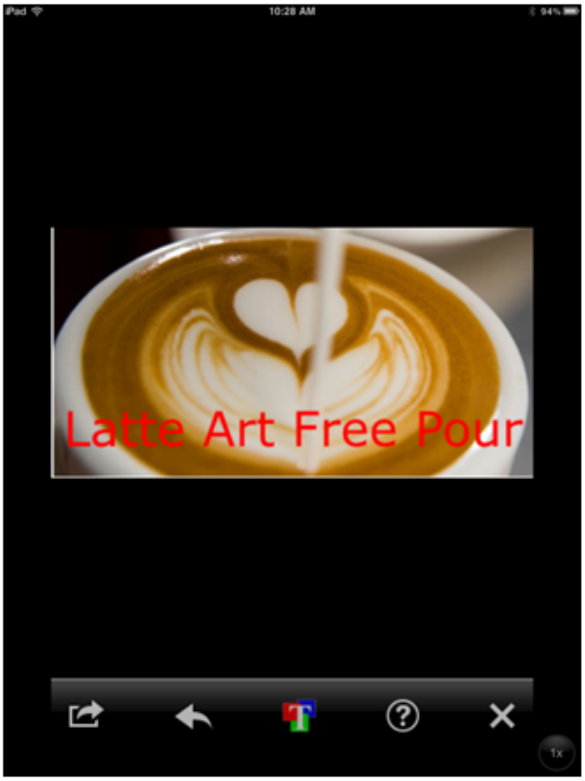


Useful Features

- **Insert or Take Photo**
- **Rotate & Crop,**
- **Contrast**
- **Black & White**
- **Borders**
- **Save to Camera Roll**

Disadvantage -
Unable to Make Comments

PixiTag Lite



Useful Features
- Make comments on Pics
- Save to Camera Roll

Disadvantage -
Unable to Crop or Rotate

IMovie

Useful Features
Insert:
- Videos,
- Photos
- Audio
- Narration
- Titles

Save to Camera Roll, Share on YouTube & Facebook

Latte Art

Useful Features

- Uses the same tools as we d
- Saves to Camera Roll

Disadvantage -

No Choc Shaker!

LEARNING OUTCOMES

1. Record Progress using a Photo Log

Track your Latte Art Progress by collecting pictures of your work at each session

2. Develop a Graphical Training Resource

Make a slideshow or movie for use as a training resource for other students

3. Create a Latte Art Design Plan

Record the steps for an original latte design

4. Complete a Worksheet

Answer the review question sheet and send to Evernote

Learning Outcome 1 -

Record Progress using a Photo Log

- You will take a photo of at least 3 beverages per session which you will then tag with a comment or rating
- You will have the opportunity to share your Log with the rest of the class

Step 1	Step 2	Step 3	Step 4
Take a Photo	Crop, Rotate	Tag, Rate	**Save with...**

Learning Outcome 2 -

Develop a Digital Training Resource

Working in pairs, choose a topic to create a training resource lasting between between 1 - 5 minutes. Topics are -

- How to Steam Milk
- How to Pour a Rosetta
- How to Pour a Heart

Step 1	Step 2	Step 3	Step 4
Film or Photograph Your topic	Create step by step instructions	Edit, Peer Trial, Re -Edit	Present to Class

Learning Outcome 3 -

Create a Latte Art Design Plan

- Using the Latte App you will create an original design with at least 3 steps and 3 design principles.
- Each Step must be photographed and tagged using the correct terminology
- You will show your plan to the tutor as part of your Latte Art Assessment

Step 1	Step 2	Step 3	Step 4
Practice and choose a design	Photograph and tag instructions	Edit, Trial, Re - edit	Present to Tutor

Learning 4 -

Complete a Worksheet

- Use the iPad to answer the Barista Review Sheet questions- Steaming Milk

Step 1	Step 2	Step 3	Step 4
In Evernote open - PDF Barista Review	Open in neu.Annotate	Scroll to Steaming Milk	Type in answers

***Appendix 6* – Introduction handout/worksheet to introduce students to use of net tablets in automotive workshop –**

produced on Show

Welcome to Android

Android Project

Task: To make a "how to guide" on safely removing a tyre from a vehicle.

Method: Using the tablet camera and two apps, Thinkfree Show and Picsay you will create a document on the steps of how to safely remove a wheel from a vehicle.

Outcome: To be able to use a mobile Android device to document a learning journey.

Step by Step Project Guide

•Scroll left and select gallery.

•Open the camera function and capture the images required. Close gallery once complete.

•Scroll right and open the Picsay app and add and edit pictures. Place on any comments etc. Close this app

•Scroll right and open Thinkfree Show and complete the guide.

Project Example

The following is an example of part of a slide show that has been achieved solely with tablet technology.

Jack and Stands
Jack and axle stands are required to safely lift the vehicle

Loosen the wheel nuts

Once you finished your "how to guide" present it to a peer for feedback.

•Edit your presentation according to your peer feedback.

•Present the final presentation to the class

Appendix 7- Student evaluation sheet

iPad Project Evaluation: Food and Beverage Level 2: 18th November 2011

1. Circle either of the following devices you have used prior to the project

   iPod touch iPhone iPad Android Smart Phone None

2. Indicate below the class time you would find most beneficial to use an iPad

   10% 30% 50% 80% 100%

3. How useful were the instructions given prior to using the applications ie. Katrina's *Getting Started* presentations

   Not Useful Useful Very Useful

4. Please list suggestions on any future aspect of iPad use in the classroom

_____

Thank you

Appendix 8 - Tutor reflection

I started into this project thinking about how we can integrate technology that most of the students have on their person to better learning use. The most common choice was cell phone technology but get a number of phones the same etc and convincing the students that they would be useful for learning was going to be tricky. I had heard from a number of students the stir that the Ipads was making and that most wanted one….. this had me thinking. So I asked the students how many of them had Apple products like Ipod touch/Ipads or I phones. Most said they had an Ipod touch but couldn't afford a Iphone or Ipad. I then asked them what they had and most said the best they could afford was android based. From this I did some investigation and found that the android based tables represented good value. That combined with the fact that most of them were using this format on their phones. I hoped that this meant they would use some of the apps to and find some other useful ones to add to their phone from the android tablet project.

Once the purchasing of the hardware had been done I spent a number of hours just getting the hang of how it worked and what was readily achievable. I found the tablets were very easy to navigate and were for the most part very intuitive. I set out to find some educational apps to try out and see how I could best use them for an automotive process. This proved to be a bit frustrating as there seems at present very little support for education use of android based tablets (unlike well documented Ipad). So after some time I decided that it would be better to choose what purpose I wanted to achieve with the tablets and work from there.

I decided that the tablet would be well suited to making a portfolio of the students work. The key to this is the fact that it had a camera (forward and reverse). I trialled taking pictures and looked for apps to present the photos and edit and annotate them. This turned out to be very successful and the students seemed to take to this very well. Most of my students enjoyed taking photos and putting them into the presentation in some form of order and adding comments. I was honestly surprised by how quickly the students got to grips with the apps and using the tablet.

I also trialled the use of the electronic text books. Most were impressed with the search engine and the information accessibility. Most thought that a Google search may have resulted in similar results but it would have taken longer to search through irrelevant information. Also online there are more distractions like facebook and trademe etc.

As yet we do not have WIFI in our building and this I believe has proved a bit of a limitation as these tablets would be much more useful in the workshop if they could access web sites like Mobil for oil recommendations, Supercheap for online parts quotes etc. I would also like to see them using electronic service forms and time keeping cards. This way they can carry out the service and check for specs, find parts and complete quotes etc. all on one device.

Other limitations that I have found is that the 10inch tablets can be difficult at times due to size. They are great for reading text etc. but are not so portable as the likes of a 7 inch. Moving forward I would like to get some smaller devices and see if smaller is better for the work I want to use them for in the workshop.

I also think a shared platform for electronic information like Moodle would also be good to help the students focus their attention to one site with all the information. I have not developed the Automotive Moodle enough to test this theory.

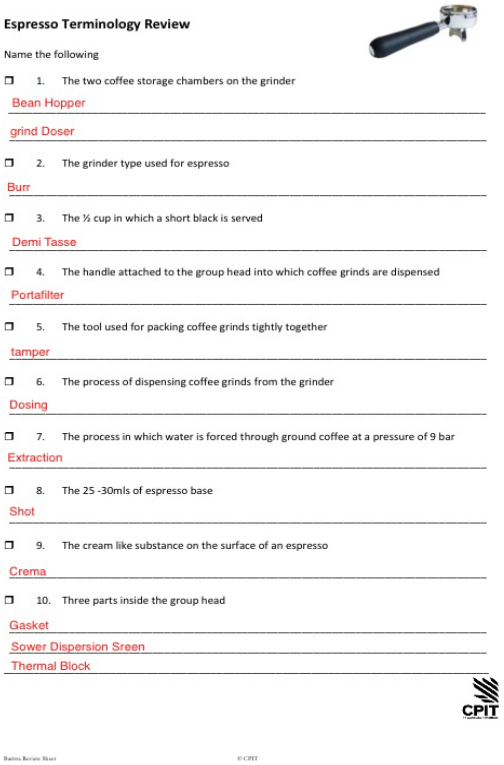
I have found that through sharing this technology and making it freely available to staff and students that a number have gone and purchased their own. This has resulted in shared experiences and a much greater experimentation of apps and applications. From this perspective along it has been worth entering into this research project.

In summary I think that tablets have a place in education especially with the making of assessment portfolios and accessing multimedia learning material.

Where to from here is that I want to investigate the use of smaller device with an in-built camera and see if they are really suited to documenting complete practical assessments and the students learning journey.

Appendix 9 – Examples of barista students' work

annotated photo of student's café art



Espresso Terminology Review

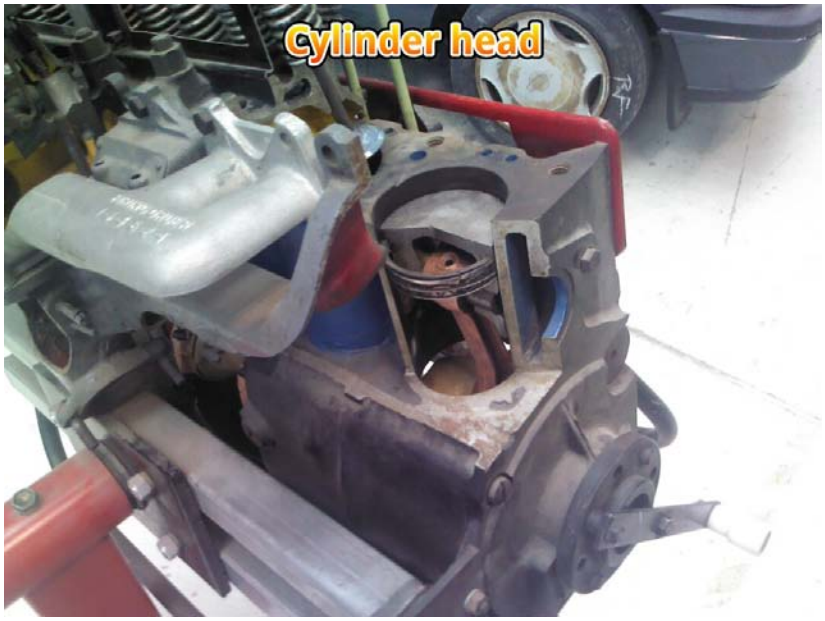
Name the following

1. The two coffee storage chambers on the grinder
   Bean Hopper
   grind Doser
2. The grinder type used for espresso
   Burr
3. The ½ cup in which a short black is served
   Demi Tasse
4. The handle attached to the group head into which coffee grinds are dispensed
   Portafilter
5. The tool used for packing coffee grinds tightly together
   tamper
6. The process of dispensing coffee grinds from the grinder
   Dosing
7. The process in which water is forced through ground coffee at a pressure of 9 bar
   Extraction
8. The 25 -30mls of espresso base
   Shot
9. The cream like substance on the surface of an espresso
   Crema
10. Three parts inside the group head
    Gasket
    Sower Dispersion Sreen
    Thermal Block

CPIT

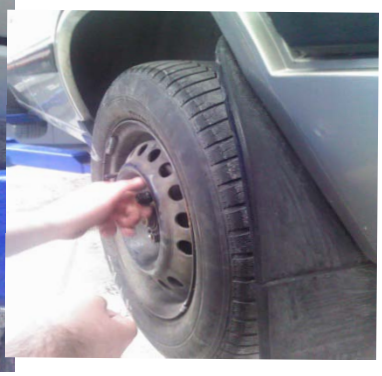
Example of completed worksheet using neu-annotate pdf editor.

Appendix 10 – Examples of automotive students' work



Bolts onto the top of the cylinder block where it forms the top of the combustion chamber

One of a large number of examples for assessment of unit standard 229 (Identify the general locations and functions of motor vehicle systems and main components) – students identify and photograph part, label and add function of part on to slideshow presentation.



Examples of student's recording of work process to meet requirements for completing unit standard 21869 (Remove and replace road wheels in the motor industry), extracted from slideshow presentation.