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# A TEACHER'S INFLUENCE ON STUDENT ENGAGEMENT: USING SMARTPHONES FOR CREATING VOCATIONAL ASSESSMENT EPORTFOLIOS

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## ABSTRACT

Aim/Purpose: The aim of the study was to investigate how the facilitation of a vocational lecturer (teacher) influenced the engagement of fifteen carpentry students during their learning. This facilitation occurred while the students used smartphones and mobile applications to create visual assessment ePortfolios.

Background: To encourage independence and peer collaboration, when creating their visual ePortfolios, the lecturer decided to get his students to use BYOD mobile devices, and social media applications to record their learning of technical skills. His intention was to make use of the devices they brought to class, and to enable greater autonomy and flexibility in the learning process by eliminating the need for digital cameras and proprietary software they had previously been using. The lecturer also saw this as an opportunity to provide more frequent and immediate formative feedback, and to encourage students to share their work.

Methodology: A Participatory Action Research design was used with fifteen certificate level students. They were guided in the use of three social media applications (apps) – Facebook, Evernote and Google Plus (G+) that they could use on their Smartphones to develop ePortfolios for assessment. Both quantitative and qualitative data was collected during four Action Cycles, and the outcomes are portrayed as a case study. Several sampling methods were used: a student pre-survey, and post-survey, observations and reflections by the lecturer, focus group interviews with students and an individual interview with the lecturer. For this article, a framework based on established factors of student engagement was used to examine the findings to establish the impact of the teacher.

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| Contribution | This paper extends the body of research about student engagement with a focus on the importance of the teacher in supporting 21st Century vocational learning and ePortfolio assessment using mobile technologies. |
| Findings | The majority of students were comfortable with the learning approach using the three applications and their mobile phones, and felt confident with the technologies. Overall, they found the learning approach was more convenient and made the experience easier, as well as enjoyable and fun. Students believed that mobile learning helped their learning and assisted them to connect with others. All three apps were considered easy to access. Facebook was the most preferred app with Google Plus (G+) the least liked. Evernote was favoured for its image editing and annotation features.<br><br>Students responded well to the lecturer's teaching methods and the learning environment he created. He was found to be pivotal to the learning process. As a result of the lecturer's learning and assessment design, students enhanced their achievement rates. He scaffolded their use of mobile technologies through: demonstrating and modelling each app at the start of the cycle of use, use of technologies during their learning, and by providing prompt, frequent and timely feedback on their ePortfolio work. Since he enabled them to use devices familiar to them, that is, smartphones, he helped them to develop autonomy and confidence.<br><br>The lecturer was supportive and enthusiastic and encouraged students through structured and well-designed collaborative activities to engage in active learning that challenged them, and encouraged collaboration. He guided them in their learning through regularly interacting with them to provide feedback, and he also added an aspect of competitiveness to the activities to motivate them. |
| Recommendations for Practitioners | Teaching staff are advised to seek guidance when designing learning activities using mobile technologies, and to access technical support. Cochrane's (2014) six critical success factors for designing learning using mobile devices would assist. Also, it would be useful to carry out a needs analysis with students and other stakeholders beforehand. |
| Recommendations for Researchers | Participatory Action Research is a robust methodology for trialling innovative learning strategies because when using this approach, researchers can be immediately responsive to the needs of the participants. |
| Impact on Society | An understanding of the factors associated with student engagement and high self-efficacy for using mobile technologies is essential for teachers tasked with designing contemporary learning activities in today's higher education learning environments. Encouraging the use of mobile devices that students own, and have familiarity using, helps to make learning and teaching more sustainable. |
| Future Research | Further research is needed to measure the impact of factors associated with student engagement, on the design of student-centred learning using contemporary technologies. It would also be helpful to examine the implications of student engagement measures as predictors of excellence in teaching, and in the development of learner capability (e.g., critical thinking, social justice awareness, reasoning, etc.). |
| Keywords | student engagement, mobile technologies, smartphones, eportfolios, vocational learning |

## INTRODUCTION

The influence of a lecturer (teacher) on student engagement in a vocational setting is examined in this paper, and is based on the outcomes of a 12 week Participatory Action Research (PAR) project where carpentry students used their personal smartphones to prepare visual electronic assessment portfolios. The choice of mobile device and three applications (Facebook, Evernote and Google Plus [G+]) utilised the BYOD (bring your own device) principle of empowering students to take responsibility for and control of their learning. The lecturer wanted to give students the chance to work together collaboratively to create evidence of their technical skill development, and make use of the smartphones that they brought to class. He also wanted to provide immediate and timely formative feedback on their work using a mode of learning that facilitated this.

The use of mobile devices is known to help personalise the learning process, making it more motivating, flexible and enjoyable, while assisting students to develop autonomy in what they produce (Murugan & Sai, 2017). However, BYOD can also cause a digital divide if some students do not own a mobile device, or do not have adequate digital skills and are required to use the technology for specific tasks (Siani, 2017). A digital divide was not an issue for the group participating in the research as all felt reasonably confident using technologies. However, they had little experience in using mobile technologies for learning, and needed support and encouragement from their lecturer. Research on the use of Web 2.0 technologies for online teaching and learning and mobile learning is reasonably commonplace, and researchers report on enhanced interactions, greater motivation, social learning, the development of learning communities and collaboration (Shen, Kuo, & Ly, 2017). In recent years, the number of students in higher education owning smartphones has increased significantly, yet the uptake of these mobile devices for learning has been slow, possibly because few lecturers have encouraged their use in the classroom (Chen, Seilhamer, Bennett, & Bauer, 2015). Even though lecturers may be willing to use mobile technologies, they may lack guidance to integrate them effectively in the curriculum, or be unable to support their students. Thus researchers have identified the need for resourcing, assistance with learning design and technical infrastructure that supports mobile learning (Chen et al., 2015; Cochrane, 2014; Santos, 2013).

Fifteen students studying the Certificate in Carpentry at Otago Polytechnic, New Zealand were required to capture a visual record of specific technical skills for assessment. Previously, the students had used digital cameras provided by the faculty, and the images they took individually were downloaded by the lecturer to the internal student drive. The students could only access the images while on campus and had to make time in the computer lab to create portfolios using the PowerPoint application provided. The lecturer was only able to give feedback to the students once their portfolios were constructed and submitted for summative assessment. This approach reduced opportunities for formative feedback during the learning process, and led to a high rate of resits, increasing the assessment workload for the lecturer. Also, the students were reliant on the lecturer to download the images, and they were restricted by the need to remain on campus to develop their portfolios. Additionally, when students were on work placements on construction sites, they were unable to obtain a visual record of their technical skills. Nowadays, students need to know how to record their progress when they are in the workplace to supplement their classroom learning.

The lecturer was interested in designing and trialling an intervention using mobile technologies within the dynamic environment of an action research methodology. He was familiar with the success of using mobile ePortfolios for workplace assessment reported by Selena Chan (2011) in her research with trades' apprentices. Participatory Action Research (PAR) was chosen for this project as it facilitates a process that is directly relevant to the participants, empowers and evolves with them and helps to find solutions to practical problems, and in turn, through its critical, experiential and reflective makeup can transform practice (McNiff, 2014). This paper, and the research informing it, is unique, not due to the use of mobile technologies in learning nor for their use in creating ePortfolios but because of the process is linked to factors (in particular the actions of the teacher) that influence

student engagement. As will be shown throughout this paper, the teacher was essential to the learning process, right from the outset when he designed learning tasks and assessments and during his facilitation of the class.

In summary, the aim of the study was to investigate how the facilitation of a vocational lecturer (teacher) influenced the engagement of fifteen carpentry students during their learning. This facilitation occurred while the students used smartphones and mobile applications to create visual assessment ePortfolios. A framework based on established factors influencing student engagement was used to examine the impact of the teaching process on students' learning.

## LITERATURE REVIEW

### *USE OF SOCIAL MEDIA AND STUDENT ENGAGEMENT*

The connection of social media to student engagement in learning has been explored in a number of research studies. Due to the potential for peer interactions, collaboration and the development of learning communities, Tarantino, McDonough, & Hua (2013) argued that an increased level of student engagement would occur when Web 2.0 technologies (e.g., wikis, blogs, audio-visual and text media, networking platforms) were integrated into the learning process. The responsibility for incorporating social media into curriculum design lies firmly with educators who wish to help students to learn in more creative ways (Tarantino et al., 2013); rather than banning the use of technologies in their classrooms for fear of disruption (Duncan, Hoekstra, & Wilcox, 2012; Johnston, 2016). Effective teaching using technologies requires an understanding of the types of learning strategies that will encourage student engagement (Evans, Muijs, & Tomlinson, 2015; Johnston, 2016), as engagement is connected to successful academic outcomes (Badge, Saunders, & Cann, 2012; Richardson & Radloff, 2014).

In a study with 675 preservice teachers in Canada, Camille Rutherford (2010) found that the relationships that students develop with their teachers and peers, when interacting through the use of social media, correlated with aspects of engagement. Namely, the greater the frequency that students used social media to interact with peers outside class, the better they perceived the quality of the instruction and the relationship they had with their teachers (Rutherford, 2010). Consequently, the researcher surmised that social media aided engagement by enabling active participation in a collaborative learning community but conceded that further research was needed to establish this (Rutherford, 2010).

More recently, the role of teachers and technology, in particular mobile social media, in facilitating creative and active participatory learning environments and communities for engaging teachers and learners in a transformational approach to education was explored by Thomas Cochrane and Laurent Antonczak (2015). These authors used a mobile social media framework (SAMR) to examine how activities and assessments could be enabled by using mobile social media during an elective course in an undergraduate design degree. During the project, "Designing with your smartphone", students were asked to create a "professional mobile social media portfolio", and had access to "an ecology of resources" such as "Google Plus (G+), Twitter, WordPress, and Behance" (p. 258).

The course lecturers modelled use of the technologies and guided all the activities as students created their mobile portfolios and collaborated to create videos. Study findings demonstrated that learners moved from a pedagogically led approach in week 1 (pedagogy), through to a teacher guided self-directed exploration in week 3 (andragogy), and student negotiated events in weeks 4 and 5 (andragogy). By week 6, they were participating independently within a learning community (heutagogy). These three phases of the continuum are known as the PAH framework (Cochrane & Antonczak, 2015) (Figure 1).

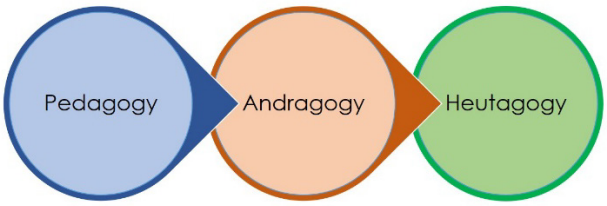


**Figure 1: PAH Framework showing the learning design continuum (based on Cochrane & Antonczak, 2015).**

The authors reported being "pleasantly surprised at the level of student engagement and activity evidenced in two iterations of the elective project …" and believed this was due to the autonomy shown by students within the learning community and their high level of interaction (Cochrane & Antonczak, 2015, p. 261). Clearly, the success of this example of mobile learning lay with the guidance provided by the teachers and the design of active learner-centred activities and assessments.

Similarly, Zepke and Leach (2010) acknowledge that teachers are pivotal to engagement and can facilitate this through enhancing students' self-efficacy (self-belief) and autonomy. Through creating an active and collaborative learning environment, teachers can assist learners to develop enjoyable learning relationships where they feel competent enough to achieve their goals. Also, engagement is more likely when the teacher creates challenging learning situations that help students develop their academic capacity (Zepke & Leach, 2010). A further indicator of engagement lies with intrinsically motivated students who want to do well and succeed in their learning (Zepke & Leach, 2010). Such students are more likely to believe they have the ability to complete tasks and this raises their self-efficacy and engagement in active learning even when faced with setbacks (Zepke & Leach, 2010). Self-determination connects closely with intrinsic motivation and feelings of autonomy, the latter developing in supportive peer learning situations, guided by teachers, where students can gain the competence and confidence to make their own choices, and engage fully (Zepke & Leach, 2010).

Notably, the approachable teacher, able to set challenging tasks and provide an affirming and inclusive learning environment, is considered central to student engagement (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006; Zepke & Leach, 2010). Not only is the teacher important, but so is the infrastructure provided by the institution to convey performance expectations and deliver support, and this includes all parties offering high quality learning environments and experiences (Kuh et al., 2006). Also, deep learning approaches are considered to be aligned with engagement, particularly when teachers promote and guide active, challenging and collaborative learning opportunities within groups or learning communities (Zepke & Leach, 2010).

Not surprisingly, intrinsic motivation is associated with self-directed and self-determined adult learners, able to adapt to unfamiliar challenges, particularly those found within creative, heutagogically designed learning situations (Gerstein, 2016). Even so, engagement not only rests with the dispositions of students, their capacity for learning, self-efficacy and ability to regulate their learning, it is also firmly correlated with specific learning strategies designed by teachers; strategies that encourage deep learning, metacognition, autonomy, collaboration and social learning opportunities (Chapman, 2003; Cochrane & Antonczak, 2015; Kuh et al., 2006; Zepke & Leach, 2010).

Furthermore, for teachers to be able to design activities that promote engagement, it is not only the self-efficacy of students that is at stake but also that of the teachers. MacCallum, Jeffrey, and Kinshuk (2014) found that "teaching self-efficacy," in particular, was closely aligned with lecturers' intentions to adopt mobile technologies in their classrooms and their acceptance of the technology (p. 141). Teaching self-efficacy was found to be present when lecturers' believed they had the ability to teach their students effectively. Additionally, lecturers' intentions to use new technologies were more likely if they believed they were relatively easy for them to use and would benefit their learners (MacCallum et al., 2015). The self-efficacy factor was found to be even more important for lecturers

than the presence of high end digital skills, although the two were linked and impacted by ICT anxiety and previous experiences in using technologies. The impact of ICT anxiety on the adoption of mobile learning was a unique outcome found by MacCallum et al. (2015), and not previously shown in this field. Comparable to other researchers (e.g., Cochrane, 2014; Cochrane & Antonczak, 2015), MacCallum et al. (2015) reported that technological support was needed to help teachers to develop more positive attitudes towards using technologies. Also, pedagogical support was needed if teachers were to shift their attitudes for using mobile learning to encourage the creation of student-generated content, rather than perceiving themselves as deliverers of content (Cochrane, 2014; Cochrane & Antonczak, 2015). For this ontological shift to happen, significant professional development was required for teachers to encourage them to interact with and model the use of mobile Web 2.0 technologies in their classrooms (Cochrane, 2014).

Therefore, it can be seen that confident teachers are more likely to support their learners' use of mobile technologies. mLearning not only makes it easier for students to obtain feedback from their teachers, it also aids flexible access to learning materials, and helps communication and team work amongst students (Yorganci, 2017). A survey of 480 first year, vocational college students by Yorganci (2017) found that students' self-efficacy in using mobile technologies was higher when they had previous experience and wanted to use them for managing their learning. These findings bode well for building a further body of evidence demonstrating that mobile technologies can support student engagement. But how do students access and use mobile devices? This is an important question to consider, especially since mobile devices were not designed with learning in mind (Traxler, 2007). This dilemma arose when the uptake of student-owned mobile devices (mainly in the developed world), particularly smartphones, first began to escalate. At the time, Traxler (2007) acknowledged that the choice of devices was extensive, and would cause challenges for educational institutions wanting to integrate their use in courses. Therefore, how mobile devices are being used in educational settings needs to be considered.

## *Mobile Devices*

Personalized and "on-the-go" learning is increasingly being facilitated by mobile devices, thus helping students to integrate their work and study schedules (Becker, Cummins, Davis, Freeman, Hall, Giesinger, & Ananthanarayanan, 2017, p. 40). Students can also interact more readily not only with content or in creating content, but also with their lecturers and each other, choosing from an ever increasing choice of applications (Becker et al.., 2017). "For higher education institutions, often BYOD is less about the devices and more about the personalized content that users have loaded onto them" thus enabling tailored learning solutions (Johnson, Becker, Estrada, & Freeman, 2015, p. 36).

Initially, the power of mobile devices was considered to come from "their ubiquity, their portability, the wide range of things that can be done with them, and their ability to access the Internet nearly anywhere" (Johnson, Smith, Willis, Levine, & Haywood, 2011, p. 13). When learners (formal and informal) have access to a mobile device, educational services as well as content and learning conversations can be accessed and consumed instantly, regardless of physical location (Traxler, 2007). Content can not only be received, it can be captured, modified, and re-created for sharing in a different form, thus turning digital information into a commodity where individual choice and curiosity is key to learning. By reversing the flow of knowledge and putting it in the hands of students and their mobile devices, the power of established curricula and formal learning is eroded and demystified, leading to more informal learning as well as autonomy and enhanced self-motivation for students and potentially more disruption for teachers (Traxler, 2007). How many teachers have you heard bemoaning the presence of cell phones in their classrooms, and students lack of attentiveness while texting and using Facebook?

Mobile devices, through their capacity to facilitate personalized learning and mobility, can blur boundaries for formal and informal learning as students combine facets of their personal social lives

with classroom interactions (Marin, Jaaskela, Hakkinen, Juntunen, Rasku-Puttonen, & Vesisenaho, 2016). Social media is a prime example of where this seamlessness can occur, and in an attempt to engage students with a familiar technology, an increasing number of academics are turning to Facebook (FB) groups as a tool for class interactions, collaborative activities and sharing (Foti & Mendez, 2014). However, even if students have familiarity with the FB platform and use it constantly for social interactions and feel comfortable using it, they are often unsure how to leverage the best learning opportunities. They may also be reluctant to blur social and educational boundaries. Therefore, teachers are essential to the sensitive design of seamless learning environments (Marin et al., 2016), where applications accessed socially by students outside the classroom are used for facilitating learning activities.

## Statistics for mobile device use

In 2015, Research New Zealand reported a 46% increase in smartphone ownership by New Zealanders over the previous three years with 70% penetration of this most popular mobile device. In comparison, overall 72% own or have access to a laptop and 51% own or have access to tablets. Age influences ownership of mobile communication devices with 18-34 year olds making up the highest percentage of users (smartphones, 91% and laptops, 85%), followed by those aged 35-54 years owning both types of device at a rate of 75%. Least ownership of mobile devices occurs if 55 years or older, with almost equal accrual of a laptop (50%) and a smartphone (45%) (Research NZ, 2015). In 2016, Tony Boyte reported that nine out of ten New Zealanders regularly accessed social media, with 67% using laptops, 65% using smartphones, 53% using desktop computers and 27% using a tablet (The Nielsen Company, 2016). Similarly, in the year 2016, the Pew Research Centre found that 77% of Americans owned smartphones, and usage was highest in the younger age groups (18-29, 92%;30-49, 88%; c.f. 50-64, 74%), with greatest dependency for these devices seen in non-whites and males. Also, 80% of people owned laptops and 51% had a tablet (Pew Research Centre, 2017). These rates are similar when compared to those for New Zealand.

This change in frequency of ownership is reflected in the increased presence of mobile devices, particularly smartphones, in classrooms, not just in NZ but globally (Dahlstrom & Bichsel, 2014). In a large research study of undergraduates conducted by the Educause Centre for Analysis and Research (ECAR) across the world, US students highly predisposed towards technology (high tech-inclined ECAR score) were found to be more likely to own a smartphone and to be five times more actively involved in courses where technology was used and mobile device use encouraged by their instructors. Not surprisingly, less tech-inclined students, in comparison, found mobile devices distracting when used in class, and although use of mobile devices for academic study was found to be increasing, in-class use was still uncommon (Dahlstrom & Bichsel, 2014).

Developing countries cannot necessarily be included in discussion about the mobile device revolution as education and income correlate with use of the Internet and how it is used (International Telecommunication Union [ITU], 2016). According to the 2016 annual ICT Development Index (IDI), developing countries tend to have the lowest rankings and therefore fall far short of ready access to mobile devices and services (ITU, 2016). IDI is a measure used to benchmark ICT (information communication technology) readiness (access and infrastructure), use (penetration), capability and impact. The top 10 rankings in order are: the Republic of Korea, followed by Iceland, Denmark and Switzerland, UK, Hong Kong (China), Sweden, Netherlands, and Norway, with Japan 10th in the rankings. Notably, the Republic of Korea and Hong Kong are classified as developing countries. Although, many developing countries are improving their ratings, in comparison to developed countries, the IDI gap is widening (ITU, 2016). This gap as well as affordability of ICT devices and services has implications for access to knowledge and education services where mobile devices and Internet are integral to learning.

Mobile learning, or learning with mobile devices, ideally needs to enable flexible educational opportunities with regard to the time and place as well as resources, and enable learners to use a device fa-

miliar to them and also owned by them (BYOD). Even so, activities for this mobile domain needs to be carefully designed to achieve student engagement in the learning process. Also, students are reliant on instructors incorporating mobile technologies in the learning process, and as few as 30% were found to do this in undergraduate courses in the USA (Dahlstrom & Bichsel, 2014). So what is the secret to effective use of mobile technologies in the classroom?

### Designing for mobile learning

Although, teachers, as well as their students, increasingly have access to mobile devices as a convenient and ubiquitous part of their professional toolkits, usage in courses of study is variable. Perhaps this is due to their need for support in learning about how to use mobile technologies in the classroom, especially if wanting to design engaging and active learning (Cochrane, 2014; MacCallum et al., 2015).

Thom Cochrane (2014) has identified six critical success factors when designing learning with mobile devices.

1. Pedagogical integration of the technology into the course and assessment.
2. Lecturer modelling of the pedagogical use of the tools.
3. Creating a supportive learning community.
4. Appropriate choice of mobile devices and Web 2.0 social software.
5. Technological and pedagogical support.
6. Creating sustained interaction that facilitates the development of ontological shifts, both for the lecturers and the students.

Cochrane (2014) subsequently found that learning designed, with these critical success factors in mind, was more participatory, and had the potential to change not only the attitudes of the teachers but also the learners as well as the learning and teaching culture of the organisation. He also found that the role of the teacher moved "from content deliverer to facilitator of authentic experience", and students became "active co-constructor[s] of knowledge" (p. 73). The informal social use of Web 2.0 tools was re-consigned for use in specific formal learning situations requiring students to generate content and collaborate as directors of their learning (Cochrane, 2014). Even so, guidance by teachers is still considered necessary for helping students to cross classroom boundaries when mobile devices are used autonomously and 'on-the-go', and for creating evidence of learning (Cochrane, 2010).

In this research study, learning tasks were designed by the teacher to guide students to develop evidence of their learning in ePortfolios that they constructed. They used their smartphones and social media applications such as Facebook, Evernote and G+ to create their ePortfolios as a visual record of skill achievement. Mobile technologies were integrated in course activities that led to assessment. As mentioned previously, the design of learning and assessment is considered to be an important influence on student engagement and successful educational outcomes. Since the lecturer designed an approach that met all of Cochrane's (2014) six critical success factors for mobile learning, he was interested in observing the outcome and the subsequent impact on student engagement.

When considering how social media and mobile devices can support learning that engages students it is necessary to understand how student engagement is defined and currently measured, and how this area of research has developed.

## *Definitions and Measures of Student Engagement*

When defining student engagement as a cognitive process learners would be expected to participate actively and be emotionally committed to their advancement of knowledge (Chapman, 2003; Zepke, Leach & Butler, 2010). Such learners would have high self-efficacy and motivation, exhibit enjoyment or satisfaction in their study, have positive attitudes, show interest in learning tasks and self-regulate the process (Chapman, 2003; Karim & Behrend, 2013). According to Coates (2008), '"Stu-

dent engagement', [is] defined as students' involvement with activities and conditions likely to generate high-quality learning" (p. 2). This means that although students do have responsibility for their learning, it is the conditions provided by teaching staff and their institutions that encourage and support their engagement in the process (Coates, 2008). Hence, factors influencing student engagement are regarded as important as the attributes that indicate that this has occurred.

Original measures of student engagement were designed to capture the effect of institutional and teaching practices on student behaviour and success, and were based on seven principles championed by Chickering and Gamson (1987). Namely, interaction between the lecturer and the students, peer cooperation (collaboration), active learning techniques, communicating high expectations and prompt feedback, time on task, respect for diversity and achievement (Grier-Reed, Appleton, Rodriguez, Ganuza, & Reschly, 2012). Kahu (2013) believes that by limiting the measurement of student engagement to these indicators alone, only a behavioural perspective of engagement for students, teachers and their institutions is obtained. This approach fails to distinguish the factors influencing engagement, the 'lived' engagement and the outcomes of being engaged (Kahu, 2013).

Over the years, cognitive engagement questionnaires, teacher rating scales and self-reporting methods have been developed and used to measure degrees of engagement, and the latter are considered useful for determining the reasons for engagement in the learning process (Chapman, 2003). One such self-reporting measure is the National Survey of Student Engagement (NSSE) and variants of it (e.g., AUSSE, Australasian Survey of Student Engagement). Both surveys have been used widely by universities and colleges to measure how undergraduates have engaged in five benchmarks (scales) of effective educational practice: i) level of academic challenge, ii) active and collaborative learning, iii) student-faculty interaction, iv) enriching educational experiences, and v) supportive campus environment (Pascarella, Seifert, & Blaich, 2010). When the AUSSE instrument was developed, two additional benchmarks, work-integrated learning and career readiness, were included and adjustments were made to the items in the other five scales to suit the Australasian context (Coates, 2011).

A component of AUSSE, the Student Engagement Questionnaire (SEQ), has been used since 2006 to measure operational aspects such as students' participation in the type of learning associated with engagement and outcomes (e.g., active and collaborative learning, higher order thinking) and the support provided by the educational organisation (Coates, 2011). Although the SEQ is regularly updated and validated to ensure currency, the focus on the behavioural perspective of engagement (students and teaching practice) has been challenged by Kahu (2013), along with the reliance on survey data alone. Kahu (2013) has voiced concerns over aspects that could potentially impact on the validity of the survey. For example, the reliance on self-reporting by students may mean that they encounter terms they may not understand. Also, the questions require students to remember events over the past academic year, and their memory may not be accurate. Additionally, the nature of the survey precludes students' abilities to describe how they feel about their learning experiences, and is not reliable for differentiating different contexts or disciplines. Hence, Kahu (2013) suggests that "longitudinal, qualitative measures may be more effective tools" and recommends a "conceptual framework of engagement, antecedents and consequences" (p. 766). This framework integrates a psychological perspective of student engagement (behaviour, cognition and affective dimensions) with antecedents such as the curriculum and organisational cultural structure and psychosocial influences (e.g., teaching, support, relationships, student motivation and self-efficacy) and immediate and longer term consequences (e.g., achievement, satisfaction, retention, work readiness, citizenship) (Kahu, 2013). Therefore, when measuring student engagement, it can be concluded that the impact of socio-cultural factors both before, during and after the learning experience cannot be ignored. This view is only partially addressed by the inclusion of work-integrated learning and career readiness scales within the AUSSE.

Clearly, the criteria used in the various measures of student engagement vary, and the dimensions used to describe this phenomenon overlap, as discussed at length by Kahu (2013). It appears that measures of student engagement depend on the area of focus. For example, is the focus on the at-

tributes associated with student engagement, or on factors influencing engagement? Or both? In this paper, only the factors influencing student engagement will be discussed, with research findings related to the attributes of student engagement to be presented elsewhere.

## *Factors Influencing Student Engagement*

Since teachers are responsible for designing the learning environment and the strategies employed therein, their actions would be expected to be key to student engagement. Research indicates that the interactions that students experience with teachers are linked to active participation in learning, academic success and feelings of support (Richardson & Radloff, 2014). A comparison of measures from the AUSSE (Australasian Survey of Student Engagement) and SSES (Staff Survey of Student Engagement) demonstrated close alignment between student and staff views for several indicators of engagement (e.g., academic challenge, enriching educational experiences and supportive learning environment). For these indicators, teachers appeared to have an accurate understanding of what the students were experiencing, and students were also shown to be "... more satisfied with their overall educational experience than what the teaching staff expect them to be" (Richardson & Radloff, 2014, p. 608). However, teaching staff and students perceived some measures quite differently, with students reporting lower rates of interaction and knowledge construction than teachers.

George Kuh (2002) considers that engagement is more likely to occur when learning environments are perceived by students as inclusive and encouraging, and expectations for achievement are reasonably high and well communicated (Kuh, 2002). Hence, he believes that good educational practices influence student engagement indicated by active involvement in the learning process and positive growth for outcomes such as "critical thinking, problem solving, effective communication, and responsible citizenship" (Kuh, 2002, p.1). Along similar lines, Zepke and Leach (2010) developed a "conceptual organiser of engagement" compiling perspectives from the research literature into a series of 'lens' aligned with "indicators of outcomes that might be achieved using each lens" (p. 2). For example:

| | |
|---|---|
| Lens - Transactional engagement (teachers) | Indicator of outcome - when students engage with teachers their learning experience involves academic challenge, active learning and collaboration, constructive interactions, and is enriching. |

Zepke, Leach, and Butler (2010) found that student respondents considered teaching and teachers to be the single most important factor that influenced their engagement (e.g., enthusiasm, feedback, interesting delivery, caring, methods for learning). Therefore, teaching and teachers are considered as central to engagement. Other aspects of the organiser were found to be of less importance (motivation and agency; transactional engagement - students with peers; institutional support; active citizenship and non-institutional support) (Zepke & Leach, 2010). The conceptual organiser for student engagement is endorsed by Kahu (2013) as a successful indicator of a number of influences on student engagement from behavioural, psychological and sociocultural perspectives. However, she acknowledges that the scope is limited by not taking into account aspects of students' identity and preparedness for higher education and wider socio-political cultural influences (Kahu, 2013).

Many of the factors influencing engagement, as summarised in Table 1, rely on the active presence of a teacher, one who knows how to design and facilitate an engaging learning experience and encourage worthwhile interactions.

Several factors appear to influence student engagement and would be demonstrated by the teacher or found in the immediate or wider learning environment. In this article, factors associated with student engagement when using mobile technologies to prepare ePortfolios were examined, in particular those contributed by the teacher as learning designer, and facilitator.

**Table 1. Established research on factors influencing student engagement.**

| Factors | Description | Research |
|---|---|---|
| Academic challenge. | Level of academic expectation is high and intellectual challenge is present & well communicated. Feedback from teacher & peers. Appropriately designed tasks & assessments. | Evans et al., 2015; Grier-Reed et al., 2012; Kuh, 2002; Zepke & Leach, 2010; Zepke, et al., 2010. |
| Collaboration. | Opportunities for students to work together & obtain peer feedback included in the learning design. | Cochrane & Antonczak, 2015; Gourlay, 2017; Rutherford, 2010; Salabar, 2014; Tarantino et al., 2013; Zepke & Leach, 2010. |
| Curriculum & learning design (for active & deep learning). | Activities, content, assessments and opportunities for interaction, reflection and deep learning are designed by the teacher. Criteria for success are communicated clearly & monitored. | Chapman, 2003; Cochrane & Antonczak, 2015; Hattie & Donoghue, 2016; Johnston, 2016; Rutherford, 2010; Tarantino et al., 2013; Zepke & Leach, 2010. |
| Facilitation. | Teacher attributes and teaching methods - approachable, supportive enthusiastic & interesting delivery. Includes regular opportunities for formative feedback from teacher. | Cochrane & Antonczak, 2015; Evans et al., 2015; Mesquita, Coutinho, De Martin-Silva, Parente, Faria, & Afonso, 2015; Johnston, 2016, Tarantino et al., 2013; Zepke & Leach, 2010; Zepke, Leach & Butler, 2010. |
| Infrastructure - technical & academic. (Supportive learning environment.) | Access to devices, Internet (Wi-Fi), learning support. Inclusive learning environment. | Mesquita et al., 2015; Kuh, 2002; Pascarella et al., 2010; Tarantino et al., 2013. |
| Interactions - relationships. | Lecturer-student, student-student; student with - software, content - interactions. Psychosocial influences determined by level & quality of interactions. Feedback from teacher & peers is constructive & enriching. | Cochrane & Antonczak, 2015; Badge et al., 2012; Gourlay, 2017; Kahu, 2013; Richardson & Radloff, 2014; Rutherford, 2010; Tarantino et al., 2013; Zepke & Leach, 2010. |

## Research question

The research question investigated in this paper is:

- How influential is the teacher for facilitating engagement in the learning process when students are using smartphones to prepare ePortfolios?

Two sub-questions were also explored.

a) What is the role of the teacher in student engagement when mobile devices are used for learning?
b) What are the contributing factors for student engagement?

# METHODOLOGY

The process of Participatory Action Research (PAR), along with the reasons this approach was taken, the participants and the context, and the methods used to collect and analyse data, is covered in this section. Data was collected during four action research cycles using: a student pre-survey, and post-survey, observations and reflections by the lecturer in class and afterwards, focus group interviews with students and an individual interview with the lecturer.

## *PARTICIPANTS AND THE CONTEXT OF THE RESEARCH*

An academic supervisor (B) and a carpentry lecturer (M) collaborated as co-researchers to investigate how a class of students studying for the Certificate in Carpentry at Otago Polytechnic (New Zealand) used mobile learning technologies to create visual ePortfolios. The study took place over a 12 week period. Seventeen students were in the class and all were invited to take part, with 15 in total signing consent forms. Ethics approval was granted by the Otago Polytechnic Ethics committee.

The majority of students in the study were aged under 20 years old, with fewer in their twenties and the oldest aged 30 – 39 years. All were male and NZ European. Carpentry as a trade in New Zealand tends to attract mainly male students, and attempts are underway to encourage more females to train. One female was studying with the group but declined to take part in the research. Variable numbers of students took part in different data collection phases of the research (initial survey - n=8; post-survey - n=13; focus group interviews - n=15; individual interview – n=1). The lecturer's observations of the learning process occurred with the 15 students taking part in the research, during class sessions and when he provided feedback on their ePortfolios outside regular teaching hours. An interview with the lecturer was carried out after the last class session for the semester.

During the planning phase for the first Action Cycle, at an initial meeting, B and M agreed on the responsibilities for each phase of the research. B took responsibility for guiding the research process, including the collection and analysis of data, and the preparation of a report. She agreed to support and advise M in planning and designing strategies that his students could use for creating ePortfolios using mobile devices and applications. In subsequent meetings, B and M discussed mobile technologies and the approaches to be used by M with his students in class, and the timing of the research activities.

All students were given the option of using a mobile device (individual smartphones, cellphone (n=1) or laptops) to participate in the course activities. They were also offered the use of departmental tablets but no-one took this option due to the slowness of the devices. During class time, students were guided by M to use specific applications for compiling their ePortfolios, regardless of whether they took part in the research. For example, in the first three weeks the class used a Facebook group, and M set this up and demonstrated how it could be used for their portfolio development. In the second three weeks, they used Evernote (apart from two students) and in the last three weeks, G+ was the application they were asked to use. At each stage, M demonstrated how to use the applications. For the final three weeks, the students were asked to choose the application they preferred (free choice), and use that one for compiling their ePortfolios.

## *RESEARCH DESIGN*

Participatory Action Research (PAR) was chosen for the investigation as a collaborative inquiry into "actual teaching practice" was sought with the teacher as co-researcher (Kemmis & McTaggart, 2007, p. 277). This type of approach to research provides participants with a sense of ownership and can be empowering (Kemmis & McTaggart, 2007). A case study methodology was used to collate, analyse, interpret and present the outcomes of the research. Case study research is an approach recommended by Yin (2014) where a number of data sources are utilised in "an empirical inquiry" to investigate "a contemporary phenomenon (the case) in depth and within its real world context" (p. 16). A

combination of action research and case study methods has previously been used with some success by Halonen (2008) during the investigation of information systems, and also by Hegarty, Penman, Kelly, Jeffrey, Coburn and McDonald (2010) when researching digital information capability.

### Action research methods

M was responsible for re-designing his course activities, with the support of B, so students could be guided to take pictures on their smartphones and upload them to a portfolio application for formative assessment. As previously stated, M chose three specific social media applications for the students to use to create their ePortfolios during the research period. He based his choices of apps on several factors: ease of use on mobile devices, availability (free and open), suitability for creating visual ePortfolios, familiarity (Facebook only), and interaction potential. The students were participants in the research, but not co-researchers. For M, and the students, mobile learning was a new experience, therefore, the activities needed to be carefully designed and scaffolded, and monitored as the students engaged in them. The activities are described further on, integrated with the data collection methods used in the four Action Cycles.

**Table 2. Sources of data collected during four Action Cycles.**

| Type of data | Quantitative | Qualitative |
|---|---|---|
| **Action Cycle 1** | **Pre-survey**: descriptive data from Likert-type responses. (See Appendix A.) | **Pre-survey:** open-ended questions. (n=8.)<br>**Field notes:** teacher observations and self-reflections. Reflective conversation.<br>**Students' mobile portfolios** - Facebook. (n=15.) |
| **Action Cycle 2** | | **Field notes:** teacher observations and self-reflections. Reflective conversation.<br>**Students' mobile portfolios** - Evernote. (n=15.) |
| **Action Cycle 3** | | **Field notes:** teacher observations and self-reflections. Reflective conversation.<br>**Students' mobile portfolios** - G+. (n=15.) |
| **Action Cycle 4** | **Post-survey:** descriptive data from Likert-type responses. (See Appendix B.) | **Field notes:** teacher observations and self-reflections. Reflective conversation.<br>**Students' mobile portfolios** - free choice. (n=15.)<br>**Post-survey:** open-ended questions. (n=13.)<br>Focus group interviews. (n=15.) (See Appendix C.)<br>Individual interview with course lecturer. (n=1.) (See Appendix D.) |

M was fully immersed in the research process and interested in evaluating and monitoring the quality of the experience for students. Qualitative and quantitative data was collected through research activities in four Action Cycles as shown in Table 2. For each cycle, the steps were planned, then monitored and evaluated using a range of strategies (discussing, learning, reflecting, understanding, and rethinking) prior to re-planning. Activities for the monitoring and evaluating phases for each step were chosen in agreement with M so that they aligned with the class activities. At the beginning of

each Action Cycle, B and M met to discuss the design of the learning activities that he could use, and they met again during the cycle to discuss progress, and lastly at the end for a reflective conversation, as a type of debrief. M kept a reflective journal in the form of a blog to record his actions, reflections and progress.

### Research activities

At the beginning of each cycle, M demonstrated examples of other peoples' work using the application he wanted his students to use. He also showed them how to use the application in a carpentry context and what was expected of them. The demonstration was done on a desktop computer attached to a data projector. M also asked the students to join a class group or a community depending on the application they were going to use, and he showed them in real-time how to do this. This helped the students begin to meet on the applications, in readiness for interacting in other contexts. For example, when showing others in class photos of the skills they were recording.

M wrote 'field notes' after each class session based on his observations of students' participation, activities and interactions. He also self-reflected about the teaching experience, the interactions he had with students and the feedback he had given on their work. These were monitoring and evaluating processes that helped him to decide his next steps in the classroom. He also met weekly to have a reflective conversation with the academic supervisor (B) about his observations, his teaching methods and learners' actions in class. The reflective (making meaning) and reflexive (questioning himself) processes he used were intended to help his decision-making, a process recommended in Bolton's (2014) work. For example, if students weren't using the application to upload their images as requested, or commenting on others work, the lecturer (M) and academic supervisor (B) discussed how students could be encouraged to take part in the learning process. Once students shared their final ePortfolios at the end of each three weeks, M also evaluated the students' outputs to gauge whether his instructions and the work they produced was as good as anticipated. He wanted to see if the support he provided needed to be increased, and to make sure that the students had understood his instructions for using each new application (app) on their smartphones. His observations and reflections and the reflective conversations assisted him to make any necessary changes for the next cycle.

The research activities and associated data collection methods for each step are discussed next.

## *Data Collection*

For each Action Cycle, the research activities and data collection methods (shown in Table 2) are described in more detail. The applications (apps) used for practical tasks are shown further on in Figure 3 in the Results.

### Action Cycle One

A student pre-survey was administered at the beginning of the research project to obtain demographic information about the class, and also how they were using mobile devices and applications, their access to Internet services, and how they used the devices for learning (see Appendix 1). Only eight students (out of the 15 who agreed to join the research) participated in this initial survey. The pre-survey was administered online in class to eight students attending on the day that the lecturer had put aside for this. The less than full response occurred because the remaining seven students who agreed to take part in the research did not attend on the day the survey was administered, and also did not respond to the survey when it was sent on email. This low number of respondents could also possibly have been due to the students being asked by the lecturer to take the survey at a desktop computer and to attend a special class session to do this. Also, it was an optional activity held prior to the first information session with the lecturer to learn about the mobile applications.

Subsequently, in class, M showed all the students how to use a Facebook group that he had set up. This platform was used first as students were already familiar with the application, and M was aware

that his class used it socially. They were asked to work in groups to take photos of each other undertaking a field levelling exercise where they had to measure ground heights on a construction site. M asked the students in groups to upload their photos and captions individually to the class Facebook page. He did this to help them gain confidence and learn together. The class did this Levelling exercise in an afternoon practical class, and M subsequently provided formative feedback on the work they posted. The final ePortfolios they produced were assessed as part of a theory unit of learning.

During this first Action Cycle, M as the teacher, observed the students' actions during the practical class, and guided them. He wrote 'field notes' and reflected on them after the class, and also wrote reflections about the ePortfolios that students produced and his feedback process. The information that he compiled was discussed in the reflective conversation with B, the academic supervisor.

### Action Cycle Two

For Action Cycle Two, M demonstrated the use of a second application, Evernote, and showed students how to use it on their smartphones. The students were undertaking practical building work on a house on-site at the polytechnic during the three weeks when this application was used. Evernote allowed them to record their learning in individual ePortfolios using a variety of media, text, images, web clippings, voice and video recordings. They had to take photos with their smartphones to provide evidence that they could identify the names of the materials they were using for building the exterior cladding, and how they were being measured, cut, installed and finished. They also had to add labels to the photos, naming the materials, and used Skitch to do this, an application that was compatible with Evernote. This work was carried out over a two week period. Again, M recorded his observations and interactions with students and reflected on the process and the assessments, and he also debriefed with B.

### Action Cycle Three

For the third Action Cycle of three weeks, M introduced students to G+, an application commonly used for communities of practice due to its interactive functionality. The teacher showed students how to join a G+ community and each had to use it as an individual rather than as a group. During this time, students were learning about applying gib board wall linings and the components and materials that needed to be prepared for a council inspection. They worked in groups of three or five, applying the lining to the on-site project house. They had to assist each other to record visual evidence of their activities. Students compiled individual ePortfolios on G+ during this time. Again, M recorded his observations and reflections over the three weeks, noting down students comments about the process and reflecting on his debrief discussions with B.

### Action Cycle Four

For the final Action Cycle, nearly all the participants wanted to use a new application. Students chose from six different applications in addition to the previous three (Facebook, Evernote, G+) for submitting their ePortfolios for assessment. These were: Notability, Google docs, PowerPoint, Microsoft Office 365, Skitch and email (see Figure 3 – note some are not shown).

During this cycle, M continued noting down and reflecting on his observations, and the feedback he gave students. M was interviewed by the lead researcher (B) once he had finished teaching and assessing the class. His reflections and observation notes prepared during the research period had been used in the reflective conversations. All this experience and information helped inform his responses during the interview and his 'field notes' and blog were not examined separately.

Additional data was collected using an online post-survey once the course work was finished. Thirteen students took part in this survey. Survey participants were asked about their mobile learning experience, how confident they felt using the three platforms – Evernote, Facebook and G+ - as well as their choice, how easy the applications were to use, whether the lecturer's instructions assisted their learning, and how they felt about their experiences creating the ePortfolios.

After the survey was administered, focus group interviews were conducted with two groups of students, seven and eight respectively, totalling 15. (See Appendix 3 for focus group interview questions and individual interview questions used with the lecturer.) Although, the number of students taking part in the second survey was two less than the 15 that signed up for the research, the full number of students took part in the focus group discussions, and developed ePortfolios. A variety of data collection methods were used and analysed to prepare the findings as a case study.

### *Data Analysis*

Descriptive statistics were used to analyse responses to Likert-type questions from the survey data. Thematic analysis techniques were used to code responses to open-ended survey questions and transcriptions from the focus group discussions, and the interview with M. Coded data was clustered in categories to represent the recurring themes, as recommended for data analysis and interpretation (Braun, Clarke & Terry, 2014; Merriam, 1998).

A case study approach has been used to analyse, interpret and present the collated data into a coherent unit of information about the outcomes of the research. Case study is considered by Yin (2014) to be an effective analytical technique, since it pulls together and interprets all the different threads of material collected during a research project. Findings taken from different sources were used to aid triangulation and validity. In this research, the case study brings together information collected from the pre and post- surveys, two focus group discussions and an interview with the lecturer. Also, theoretical information about how teachers design mobile learning and learners utilise mobile technologies and the connection of specific factors to student engagement was also examined to inform the case study. This included the framework of factors collated previously (see Table 1). Also, implementation of aspects of the PAH Framework (Cochrane & Antonczak, 2015) was investigated. Note that the questions posed in the pre-survey provided information about the students and their existing use of mobile technologies whereas in the post-survey students were asked about their experiences using their smartphones and mobile applications during the research project.

## RESULTS

A case study depicting how mobile applications and devices were used in each Action Cycle, and the lecturer's experience and observations is reported in this section. The case study also includes insights into the factors known to influence student engagement, and these are presented near the end of this section. The findings were obtained from various data sources as previously mentioned. The results are organised as a case study under three main headings.

**1. Students' use of social media applications.**

Analysis and interpretation of data for this aspect is compiled from the lecturer's observations in the four Action Cycles, his assessment recording and from the interview with him as well as from the post-survey responses (n=13) and the focus group discussions (n=15). One example of an excerpt from a student ePortfolio is presented.

**2. Use of mobile devices for learning and compiling ePortfolios.**

Pre-survey responses (n=8), the observations of the lecturer during the four Action Cycles, responses in the post-survey (n=13) and focus group discussions (n=15) contributed data about how students used their mobile devices for learning and assessment ePortfolios.

Post-survey participants were asked about their mobile learning experience, how confident they felt using the three platforms – Evernote, Facebook and G+ - as well as their choice, how easy the applications were to use, whether the lecturer's instructions assisted their learning, and how they felt about their experiences creating the ePortfolios.

**3. The lecturer's experience with mobile technologies.**

An interview with the lecturer provided data for this part of the case study, and was underpinned by a discussion of his observations during the four Action Cycles, and his views about the eportfolios that students produced for assessment.

**4. Factors associated with student engagement.**

The literature review has provided the theoretical basis for examining the factors associated with student engagement (see Table 1 for a summary). The findings from both surveys, the focus group discussions and the lecturer interview were examined for the presence of factors known to influence student engagement.

## *1. Students' use of Social Media Applications*

To begin, the work of student A (Figure 2) is used to illustrate the outcomes of using Facebook (FB) as an ePortfolio platform. FB was the first application selected by M for the students to use in Action Cycle 1, and based on the PAH framework (described by Cochrane & Antonczak, 2015) was a teacher-directed pedagogy in the first instance, and then student-directed and guided by the lecturer (andragogy). Student A was undertaking an assessment task where he had to demonstrate competency in field work 'Levelling' (see EP05, shown in blue, in Figure 3). The exercise was completed by all of the students in one afternoon practical class using automatic levels, levelling staffs and field books.

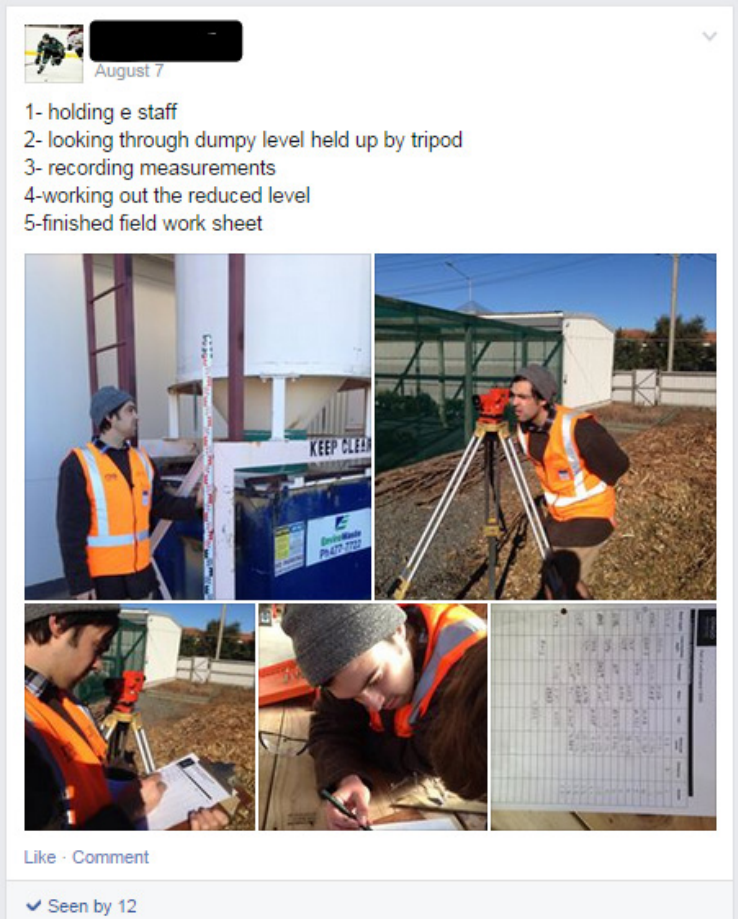


**Figure 2. An example of student A's work on Levelling as shown from his Facebook post.**

The tools were identified in their ePortfolio and the field book photographed as a reference. This ePortfolio assessment completed about 75 percent of a theory Unit Standard – Unit standard 13005 (http://www.nzqa.govt.nz/nqfdocs/units/pdf/13005.pdf). Student A was one of 15 students who used the application to prepare their portfolios. The photos of him undertaking the skills were taken on his smartphone by his peer group and then Student A posted them on Facebook. According to M, Student A received positive feedback from him, via FB, affirming that his work met the standard required; this was useful to the other students because his work showed what was needed for the assessment task. M felt that Student A was confident in his own abilities and did the task easily, posting the photos to Facebook quickly after the task was completed. M said that Student A's post attracted a lot of interest from his fellow students (note on the image, "seen by 12") and this may have helped to guide them when doing the task.

Facebook was considered the easiest and most fun app to use by the students, and this emerged as a strong theme from the open-ended question responses to the post-survey and in the focus group discussions. They also said that they preferred FB to the other apps they tried, as they found it easy to use and were already familiar with using it socially. However, they did not like the idea of mixing their social profile with the learning activities they were asked to do. Therefore, they preferred to have a class FB group as it felt better interacting on FB using this, and they could exchange and share photos that way. According to M, if students had omitted to take a photo of a skill they needed for an assessment task or their own photo did not work out, they were able to use those of their peers in their ePortfolios, as long as they had done the skill. Some of the students said they found it challenging to keep track of their photos on FB as they sometimes got lost in the messaging facility. Overall, the use of Facebook was preferred by the bulk of the students for compiling their ePortfolios.

### Evernote

Evernote was the second application to be used by the students, and this occurred mainly in Action Cycle 2 with some students opting to also use it in Action Cycle 4 when they had free choice for selecting an app for their ePortfolio. Again, M selected the app and initially directed then guided students to use it, as they constructed their ePortfolios. Therefore, similar phases of the PAH framework (described by Cochrane & Antonczak, 2015) were completed when Evernote was used for the ePortfolio development tasks. Similar to FB, Evernote was regarded favourably by all the students, and in this case, mainly for the ease of editing their images and sending them to the lecturer, and also because it enabled the uploading of photos straight from their smartphones. Most people hadn't used this app previously but this did not appear to affect their ability to use it. However, no one explored features such as being able to organise files in notebooks nor did anyone decide to pay to have a premium account so they could share their work institution. Even so, one student thought he might use Evernote in future, during his apprenticeship. Therefore, a strong theme associated with Evernote in the focus group discussions, was that the students preferred Evernote for ease of collation, annotation and uploading: "When you['ve] got the photos there, you can just quickly edit them and write what you need to on them and then just send them straight away. Nice and quick."

During the time they were using Evernote, the class was learning to do Exterior Wall Cladding (see Exterior Cladding, EP17, shown in green in Figure 3) and the application allowed them to more easily label the 10 different components associated with putting weatherboards on the outside of a house. This was important because the ePortfolio assessment required them to identify and describe different components in the images associated with the various skills they were learning.

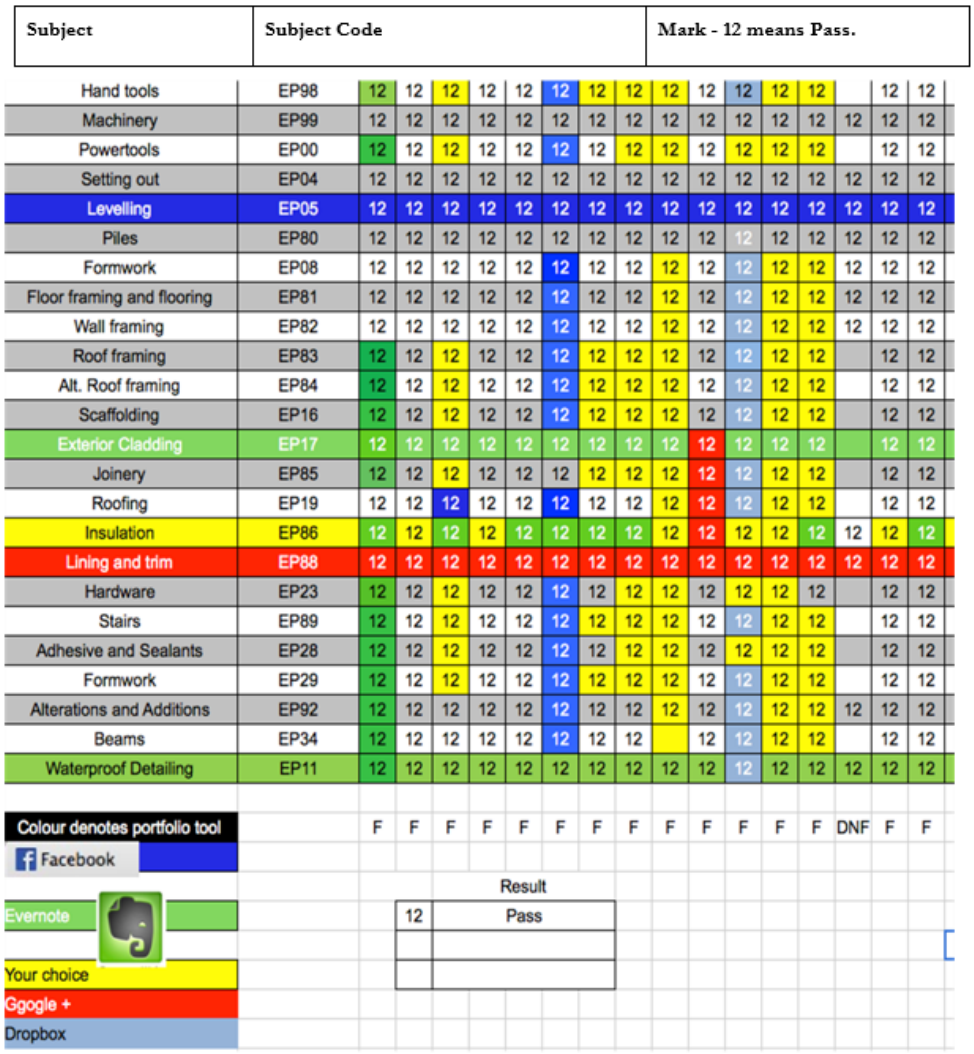


**Figure 3. Applications used by students for assessment in different subjects during a 12 week class as they created visual ePortfolios in a carpentry course.**

## Google Plus (G+)

The third application used by the students was G+ and this was introduced to them by M in Action Cycle 3. The assessment task was called Lining and Trim (see EP88, shown in red in Figure 3). Again, M demonstrated how to use the app, and in the interview described how students undertook the activities for their ePortfolio work.

> "… as a group they had to measure up the wall lining, and … show evidence of how they measured and then ordered materials. So it was a photograph showing measurement and then a photograph showing the sizes of the wall lining, because … there's all these different length sheets. And then how they cut it and how they fit it. So there were different guys doing different things during that exercise. And because they took ownership of that room or that part of the house, then suddenly they knew what photographs they had to get, they all worked really closely together." (Interview with M, 2014.)

The majority of students found this application difficult to learn and use, and commented that it often froze when they were using it and they needed to undertake updates to the browser they were using. Two people said they liked the G+ option because they could automatically send images to the app from their smartphones once Wi-Fi access was available. This meant that images would be saved in the cloud and not lost, for example, if the phone was damaged. One person pointed out in the discussion that FB could also be set up like this.

In the focus group discussions, a strong theme emerged that students disliked G+, and this was due to the fact that it froze or they needed to update their browser to use it. Also, they found it not only hard to learn to use, it was also challenging functionally, for example, when uploading photos. In comparison to FB and Evernote, M said that G+ did not work as well for developing the ePortfolios. Although, M spent time showing the students how to use the application, when it was used on mobile devices such as the students' smartphones and the departmental tablets that some tried using in class, most of the G+ features were lost. Therefore, labelling and uploading the images was a lot harder, and needed to be done on a computer or laptop. Also, at the time when they were trialling G+, the polytechnic Wi-Fi in the department was not working properly and this made it difficult for the students to use the app on their devices.

## Summary

The full extent of how students used the applications for the different assessment tasks is shown in Figure 3. For example, everyone used FB for 'Levelling', Evernote for 'Exterior Cladding' and G+ for 'Lining and Trim'. In the tasks where students had free choice, a mix of apps (FB, Evernote, G+ and DropBox) were used as shown in Figure 3, as well as Notability and Google docs (not shown).

Overall, as indicated by the post-survey, the majority of students (77%) found the three applications (Evernote, Facebook and G+) easy to access and use and were confident with using them. Most of the students found the lecturer's instructions for using the apps clear and helpful, in particular, his step by step instructions on PowerPoint made it easy to compile and complete the ePortfolio. Also, in their comments, the student respondents indicated how easy it was to carry out the instructions, and that they felt comfortable with the process. They also stated that it was useful having time to play with the apps and learn how to use them, although they found some easy to learn but hard to use to complete the ePortfolio. Even though, the students said in the focus groups that they liked trying all the different applications, they thought it would be easier to collate all their photos in one place rather than switch between applications over the 12 weeks as they were asked to do by the lecturer.

The nature of the directed learning and assessment tasks meant that overall the learning process was not a student-negotiated one, although students could make their own decisions about how they managed their work. Therefore, based on the PAH framework (Cochrane & Antonczak, 2015), only methods aligning with pedagogy and andragogy were designed and actioned (Figure 4).

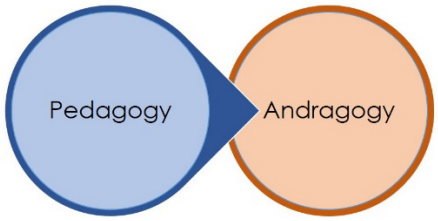


**Figure 4. Two phases of learning design on the PAH Framework continuum.**

## 2. Use of Mobile Devices for Learning and Compiling ePortfolios

The lecturer knew that all but one of his students owned a smartphone, and this provided the impetus for using an ePortfolio mLearning approach. Initially, it was important for him to obtain formal information about their use of mobile devices both socially and for learning, and to gain some insight into their attitudes towards using mobile technologies. This was done by using an online pre-survey. Eight out of the 15 research participants responded to the pre-survey.

All eight students apart from one owned a smartphone, and the person with a basic cell phone was able to use it to take pictures but was unable to access Wi-Fi. Most of the students were relatively new to the world of smartphones owning them for less than 12 months and up to two years. Everyone apart from two students used data and three preferred to use Wi-Fi. Only two students owned tablets and did not use them at the vocational institution where they studied. Five students owned a laptop, but only two brought them into the institution to use in their study. However, information about the state of play regarding these factors for the other seven students was not obtained.

Several applications were already being used by the students for social purposes, or for their functions (camera, flashlight, calculator, Notepad and Spotify - music) with only two used for study. The most common apps in use were: Facebook including Messenger (social and study), Instagram (social), Evernote (study), Snapchat (social), and YouTube (social). As can be seen from this list, the majority used by students were Web 2.0 apps designed for social interactions.

From the pre-survey responses it appears that eight students were already using some type of mobile device for some specific learning activities (see Figure 5). This group of students most commonly used laptops, and to a lesser extent, smartphones for primary learning activities, such as: accessing online course materials, searching for information, writing emails, downloading resources, watching videos, uploading materials, web conferencing and listening to audio or podcasts. Furthermore, regardless of the device, writing emails, searching for information on the Internet and watching videos were the most common learning activities. Minor use was made of smartphones for keeping notes, uploading materials and web conferencing, and a laptop was used by two students to write assignments. Therefore, as the research started, students were already familiar with using a variety of Web 2.0 applications, and laptops were preferred for learning tasks.

Mostly, the students found technology easy to use, and one thought it depended on the type of programme. Five felt they did not need help to use their mobile device for learning, and two said they needed help (one did not respond to this question). Two participants thought they could easily find information, on how to use the applications, themselves.

Considering, that the students were asked to use two applications, unfamiliar to them, for their ePortfolios it was good to know as the research started that the majority of the surveyed group had a positive attitude towards using new applications. Also, most appeared to have some degree of self-efficacy for using the technologies. However, this information was not provided by the other seven students as they did not participate in the pre-survey.

| # | Question | Smartphone | Tablet | Laptop | Total |
|---|---|---|---|---|---|
| 1 | Accessing course materials or discussion forums on Moodle | 3 | 0 | 3 | 6 |
| 2 | Downloading resources | 2 | 0 | 3 | 5 |
| 3 | Listening to audio or podcasts | 2 | 1 | 1 | 4 |
| 4 | Note taking | 1 | 0 | 2 | 3 |
| 5 | Searching for information on the Internet | 4 | 1 | 3 | 8 |
| 6 | Searching library catalogues or databases | 1 | 0 | 1 | 2 |
| 7 | Uploading materials | 1 | 0 | 3 | 4 |
| 8 | Watching videos | 3 | 1 | 3 | 7 |
| 9 | Web conferencing (e.g., Skype or Adobe Connect) | 1 | 1 | 2 | 4 |
| 10 | Writing assignments | 0 | 0 | 2 | 2 |
| 11 | Writing emails | 4 | 1 | 3 | 8 |
| 12 | Other (please state) | 0 | 0 | 0 | 0 |
| 13 | None of the above | 1 | 1 | 0 | 2 |
| 14 | Not applicable (I don't own this device) | 2 | 6 | 2 | 10 |

**Figure 5. Learning activities undertaken by carpentry students using mobile devices (n=8).**

## Insights of the lecturer and students

The observations of the lecturer during the four Action Cycles, revealed some insights into the way students were using their mobile devices. M chose the applications because he believed that they would be accessible on the devices that students' owned, and he knew that everyone apart from one student in his class owned a smartphone. Therefore, he wanted to leverage this opportunity knowing that the students were more likely to understand the features of their smartphones and how they worked. According to the pre-survey, they owned a mix of android and iPhones but M said the make of phone didn't matter because the applications he chose worked across three main platforms (iPhone, Android, Windows10 mobile). He believed that the advantage of using smartphones, meant that the students could take photos as they went as a personal record, and easily put together an ePortfolio using each application. M's perception fits with the students' views in the focus group discussions where they all said that the most positive outcome was that they could use their smartphones to create their ePortfolios for assessment.

Unanimously, during the focus group discussions, the students expressed that the three applications made the process easy and convenient, once they had learned about how to use them from the lecturer. They saw no reason to use tablets as their smartphones could do everything that was needed, and also few people owned a tablet, and the departmental ones were too slow. The students liked how photos could be taken on their smartphones, labelled or annotated straightaway (particularly in Evernote) and sent to the lecturer using whichever platform they were trialling at the time. Most of the students preferred the mobile learning option to PowerPoint for compiling their ePortfolios which they found cumbersome and time consuming. A few comments in the post-survey, supported this sentiment: "… simplified everything, PowerPoint is more time consuming; this streamlines the process. Just goes quicker." Even so, two people thought it was easier to collate images using PowerPoint. In the main, the students believed that the applications they used made it easier for sharing photos and catching up on work if they had missed a class.

- A strong theme in the focus group discussion was that students found the mobile learning option more convenient and easier. For example, "it was just handy, you could go out and take photos and … comment on them straight away rather than taking a photo and coming back to it later."

These views that students expressed in the focus groups, match the responses in the post-survey (n=13). An overview of how students perceived the three applications and the benefits and barriers to using them is shown in Figure 6. Just over half the respondents (53%) said they found the mobile learning experience enjoyable and fun. Also, using a mobile phone for preparing the ePortfolio was regarded as easier for 84% of the students than preparing one using a desktop computer as they had previously done. They liked the convenience of always having the phone with them, being able to work at home, and were comfortable using a mobile phone to send photos from smartphone to computer via email.

Also in the post-survey, most students (69%) indicated that creating an ePortfolio helped them to learn. The primary reasons they stipulated for the ePortfolio helping their learning were that they could "look back" and use it for study and review at a later date, and one person liked the opportunity to learn visually. Conversely, two respondents found the ePortfolio unhelpful stating: "distracting and annoying while I'm… working", "didn't particularly enjoy it", and "felt it was disruptive." For some reason, less than half the group (46%) found that using a mobile device made their learning more interesting. The same percentage (46%) were noncommittal about using a mobile device, and one person was strongly against the use of mobile devices because "it took up time." One person commented that: "finding photos was sometimes annoying", but others found it "quick and easy", and "it was a good change from what [they] had been doing earlier in the year" or they stated that they "enjoyed it." Therefore, the students expressed a number of opinions about the experience.

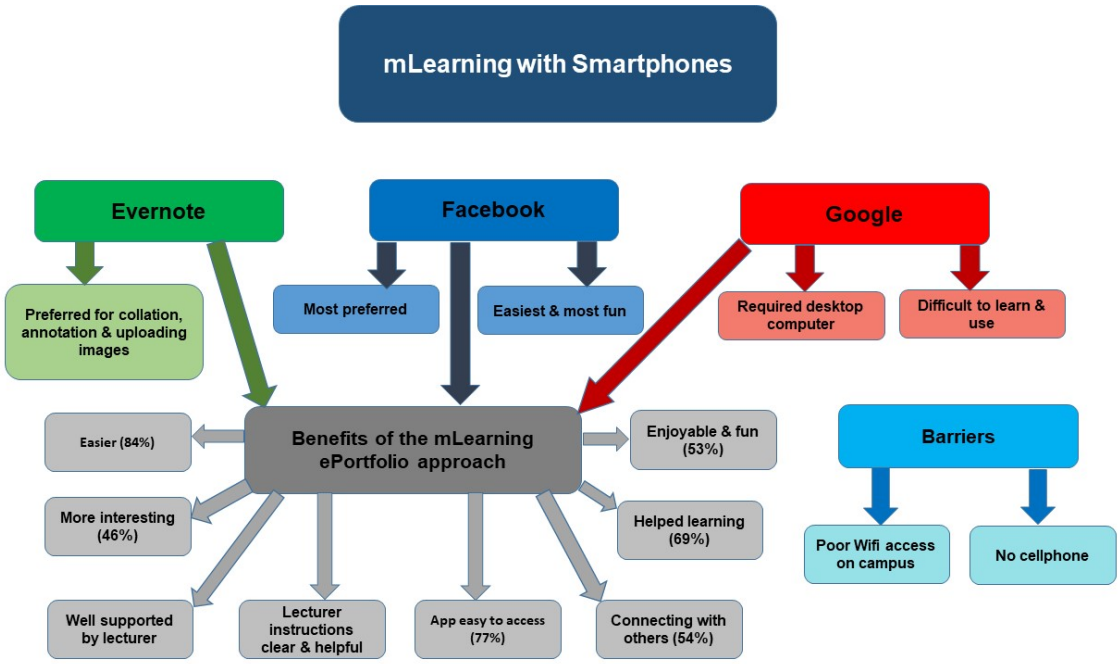


**Figure 6. mLearning with smartphones - benefits and barriers of three applications.**

The benefits of connecting with others in the class to develop their ePortfolio were appreciated by 54% of the respondents. Also, the value of the lecturer was commented on: "a good solid tutor also funny and easy to approach."

Overall, the 13 students that responded to the post-survey found the experience using mobile learning enjoyable and fun and were mostly confident learning to use the applications. One specific barrier to their ePortfolio experience was poor access to Wi-Fi, as expressed by all students in the focus group discussion. They said that they had difficulty accessing Wi-Fi in the departmental buildings and on the house site where they practised a lot of their skills that they had to photograph. This meant that most of their ePortfolio construction had to happen at home outside the classroom or in the computer lab as most of them were reluctant to use their own data to transfer images to the platforms. Consequently, this factor may have impacted on their enjoyment of the mobile ePortfolio experience.

In the focus group discussions, students also mentioned their future use of the ePortfolio work. Five participants thought the ePortfolio would be good for reviewing their work, for example, if building a house later on. As one student stated: "If I was doing my own house, I'd probably look back at the framing, full framing, because we need to know all that …." They also mentioned using their mobile devices for other learning such as looking for information on the Internet and checking class notes if they found the lectures hard to follow. Therefore, the students were thinking about the benefits of using mobile devices and apps for their future learning. Students' responses specifically relating to the three applications have previously been discussed.

## *3. The Lecturer's Experience with Mobile Technologies*

M was interviewed to discuss his experience in the research study. He had decided to get the carpentry students in the class he was teaching to use mobile devices such as their cell phones so they had a different option for creating their ePortfolios. He trialled the use of mobile portfolios in an endeavour to help them to engage more with learning the technical carpentry skills they needed to know so they could organise photographing what they had done themselves, using their smartphones. He felt that this had occurred and students were more invested in their learning.

The previous strategy with a digital camera provided to students meant the lecturer had to take responsibility for the distribution of the photographs rather than the students having control of what they were doing. Students had previously only worked with the images once a week when adding them to PowerPoint portfolios. M felt that with the mobile learning option: "… the responsibility and the workmanship just lifted a little bit. Because they were so much more engaged than just grabbing a camera and seeing when other people had taken photographs." The new approach also meant that the students could take photos themselves using their cell phones and help peers, thus making them more independent. Most of the project work they carried out was on a house that they built as a group, and some was done for individual projects. They had to take photos to demonstrate an understanding of the carpentry skill they were learning and the steps. They generally did this at the end of the task they had carried out, for example, building the components of a roof.

- More importantly, M felt that the ePortfolio had reduced the marking of the written assessment for the course by 30%.

The students created their ePortfolios after they had done the skills activities and taken a series of photos collecting specific evidence that was needed for the assessments. Also, the students all preferred to compile their ePortfolios after class at home which he believed was a drawback in terms of the lack of immediacy. Even so, the process helped them to interact with each other more as they had to decide which photograph they should take next when undertaking the learning tasks, and they did this in four groups.

- M's view is supported by 46% of students who believed that the ePortfolio work helped them to connect with others in the class.

M observed that the students tended to all take their phones out at the same time and take photographs as a group. They also helped each other by working collaboratively, for example, pointing out

things others might not know and providing peer feedback and advice. M also found that the students became a bit more competitive which helped them to engage better as they were more interested in what they were doing.

He believed that the first platform (Facebook) he used with the students worked really well because the students were already using it socially. However, it did not work well at first until he set up a Group page for the class as the students did not want to be "his friend." After he set up the class Group page, the students started uploading their photos there and interacting. This process also helped peer learning as they could see the feedback that M gave to other students, and learn from it. It also meant that they mostly had individual photos rather than all using the same photo as they had done when using the class camera.

Even though there were some issues with Wi-Fi access and the use of G+, M felt that the students enjoyed the experience of creating their ePortfolios using the three applications. This view aligns with the students' responses in the post-survey. In particular, he felt that they liked the incentive where they could take the Friday off if they had completed their ePortfolio work by Thursday evening. Putting together a visual ePortfolio also encouraged the students to communicate with each other more and develop a different level of relationship with each other and with him as the lecturer, which felt more social. Overall, the students were reasonably competent, technologically, although a few had issues such as losing images or getting frustrated and a bit angry when the Wi-Fi did not work or things went wrong.

An unexpected outcome of the mobile learning project was students sharing images of their work experiences, mainly on FB. M felt that sharing their work experience photos overcame the difficulties that students usually had when trying to explain to their classmates what they had been doing. M also found that the visual record was much more useful than a signed form from the employer denoting the student's standard of work and helped him to determine a student's success more accurately. Also, the photos that students collected about their work experience stimulated extended and lively class discussions about the work, and what they had done because they were really interested in sharing what was shown in the photos.

M was really positive about his teaching experience using the three applications and planned to use it the following year. He had changed the way he taught to be more learner-centred and he believed that the class was more engaged as a result and got through the work faster than previous classes.

- He believed that the learning the students gained from the ePortfolio work was beneficial. This view coincides with students' responses to the post-survey where 69% indicated that creating an ePortfolio helped them to learn.

M found that the students asked more questions as opposed to just being told information, and their understanding was clearer because they could see photos of what they had been involved in as it was being explained to them. The process also lifted the standard of work as the students knew others, such as friends and family and builders, would see their work, and this introduced an element of competitiveness into the class. Overall, M was very pleased with how the research approach had developed both his learners' participation, interest and achievement, and also his teaching practice.

## *4. Factors associated with student engagement*

M believed that the level of immersion in the learning and assessment tasks he observed gave an indication that the students were interested, emotionally connected, curious, and actively learning. To a lesser extent, M considered the students to be working autonomously on their ePortfolios as they were able to some extent to work alone, or with peers, make decisions, and continue on tasks independent of him. M was considered by his students to be an approachable and supportive lecturer and he provided regular and prompt feedback on the photos that students compiled in their ePortfolios.

The findings from the surveys, focus group discussions and lecturer interview were examined for factors known to influence student engagement (see Table 1) and examples of some of the evidence are summarised in Table 3).

**Table 3. A summary of evidence portraying factors influencing student engagement.**

| Factors | Comments |
|---|---|
| Academic challenge | Students were providing evidence for formative and summative assessment at certificate level using methods that were unfamiliar for learning. The academic expectation was to complete all activities for a pass and a moderate degree of intellectual challenge was present. Feedback was provided frequently to support their learning. In unit standards assessments, students could repeat as often as necessary until a pass was obtained. Tasks were designed to extend their learning. Expectations of assessment requirements were communicated frequently to students. |
| Collaboration | Students worked consistently with others in class to create their individual ePortfolios and made decisions with peers. They gave each other feedback on their work. Peer learning was integral to the process as they had to interact in groups and reflect on the evidence they were collecting for their ePortfolios. |
| Curriculum & learning design (for active and deep learning). | M was responsible for the design of learning activities, content, assessments and deep learning. He used research evidence from similar mobile learning projects to inform his approach, (e.g., Cochrane's (2014) critical success factors) and reflected on his teaching and students' progress during the Action Cycles, adjusting his approach as needed. According to M academic achievement was enhanced. |
| Facilitation | M took care to support the students well all through, providing prompt and frequent feedback. This helped students reflect on the quality of their evidence. His teaching methods were innovative, reflective and appropriate for the level of study and in tune with his students' abilities, pedagogically and technologically. M was regarded as approachable and demonstrated excellent rapport with his students, and they appreciated his teaching approach. |
| Infrastructure - technical & academic. (Supportive learning environment.) | This included access to mobile devices, Internet (Wi-Fi) and learning support when creating ePortfolios. Poor Wi-Fi connectivity was a barrier for using some of the apps, and one student did not have a smartphone. M provided well-structured instruction and guidance for using the apps. |
| Interactions - relationships | M viewed this aspect most highly. Students interacted frequently with the lecturer and each other and used several different applications to compile ePortfolios. They helped each other make decisions about their photos. Students could see the feedback M gave others and learn from this. Other students created a social learning environment and shared work with each other. They also wanted to interact with students in the class that followed, to help them. |

An indicator that students had greater success as a result of the mobile learning methods used during the research project was demonstrated by a higher rate of achievement the first time they submitted assessments.

- M found that the ePortfolio significantly reduced the number of resits for assessments (20 in his class compared to 80 in other groups).

M thought that the improved achievement was probably due to the more individual help he could give to struggling students, and the immediacy of his feedback using the applications. The flexibility of the ePortfolios meant that M was able to give feedback to the students on their work at any time, and he tended to do this at home in the evenings; however, this was a slight concern to M as he felt it blurred the work/home boundaries.

M believed that being able to give instant and regular responses to students' questions and feedback on their work was better for their learning because it helped them to progress. He said, "Once they had tried the new method I always gave them fast and supportive responses."

He also felt that his enthusiasm and support helped to motivate the students to try something new, and was attune to the importance of effective facilitation for influencing engagement. He considered the most important motivating factor was when he made class attendance on Friday mornings optional if they had their ePortfolio work completed prior to the Thursday each week. He believed that this "was a major help to them because of social lives, family commitments and work."

- Ninety-two percent of M's students found his instructions for using the applications (Facebook, Evernote and G+) clear and helpful (post-survey), and this rating is re-iterated in the comments accompanying the post-survey question.

The design of the learning strategies M used was evidence-based (Cochrane's (2014) critical success factors) and he reflected regularly during the four Action Cycles so he could be responsive to the students' learning needs.

In summary, aspects such as M's enthusiasm, his caring attitude, the level of feedback he provided, and the interesting and effective design of the teaching and learning methods using BYOD mobile devices and visual ePortfolios align with Zepke, Leach and Butler's (2010) top ranking items for teaching to support student engagement.

## DISCUSSION

The action research methodology worked well for this study enabling the lecturer to introduce three different social media applications to students in a series of four Action Cycles. During this time, he was able to gather an eclectic mix of data and monitor and reflect on the learning and teaching process. M's primary goal was to facilitate his students seamlessly through an innovative learning experience, making use of a variety of technologies, one of which they used regularly for social activities (FB). He guided them to create visual ePortfolios as final outputs for the assessment of technical carpentry skills. The case study reveals several aspects associated with student engagement and highlights the importance of the lecturer's role during the learning process.

M's design of the teaching and learning approach was based on Cochrane's (2014) six critical success factors for designing learning using mobile devices. The embedding of mobile technologies within the learning activities and assessments, potentially set in motion several features associated with active participation and co-construction of knowledge. Importantly, educational design for active learning is considered as one of the factors impacting on engagement (Grier-Reed et al., 2012). Six factors influencing student engagement were listed in the framework presented in the literature review (Table 1), and evidence of these was explored in the various sources of data collected during the research study and a summary presented in Table 3.

The case study is discussed in this section to demonstrate how the research question and sub-questions have been answered.

- How influential is the teacher for facilitating engagement in the learning process when students are using smartphones to prepare ePortfolios?
    - What is the role of the teacher in student engagement when mobile devices are used for learning?
    - What are the contributing factors for student engagement?

## *Factors Influencing Engagement*

The teaching methods used by M to facilitate his learners and the characteristics he exhibited during the process meant that he was pivotal to the learning process. His demonstrations at the beginning of each Action Cycle, when students were shown how to use a different mobile social media application, modelled the tools they needed for compiling their ePortfolios. This modelling as well as the integration of smartphones owned by students and Web 2.0 software applications relevant to the learning process and assessment and the teaching process fits well with several of Cochrane's (2014) critical success factors (CSF) (namely CSF 1, 2 & 4) (see Figure 7). Additionally, M's prompt, regular and timely feedback provided both technological and learning support (CSF 5), and also contributed to the success of the initiative as he encouraged the students to interact in their learning community (CSF3), and persevere until they had completed the assessed tasks (CSF6).

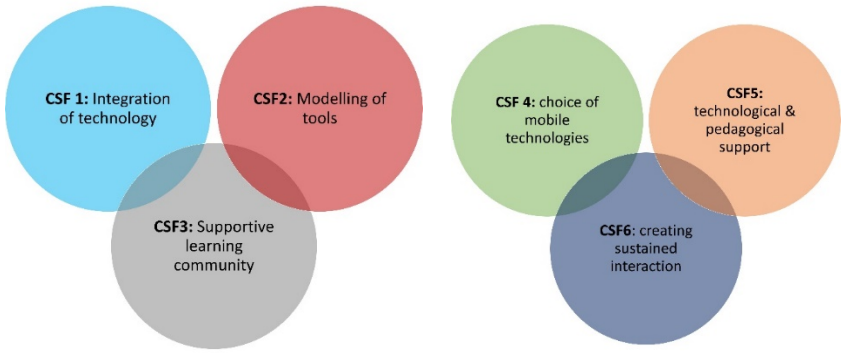


**Figure 7. Critical success factors (CSFs) for designing learning with mobile devices (based on Cochrane, 2014).**

M said in the interview that he closely observed the students activities and interactions, and monitored how well they were participating and completing the learning activities, stepping in to assist and encourage the students as needed. This indicates that he cared about the success of his students, and meets factors identified by Zepke, Leach and Butler (2010) as integral to student engagement.

The pedagogical support provided by M as the students created their visual ePortfolios, while learning practical carpentry skills, fits with the concept of Skill, Will and Thrill described by Hattie and Donoghue (2016). Students could use technologies that they already knew (Skill) and they could gain small successes through M's guidance because he made sure that they understood what they needed to do (Skill). M supported his students to develop the dispositions they needed (e.g., confidence, collaborative, self-determination, control, autonomy) for engaging in the learning environment that he created (Will), and he did this by motivating them with his enthusiasm, the guidance he provided and the element of competitiveness instilled by the approach (Thrill) (Hattie & Donoghue, 2015). Enthusiasm, feedback and interesting ways of learning were key indicators identified by Zepke, Leach and Butler (2010) that impacted on student engagement. The students also had other motivating factors

such as the captive audience provided by their classmates and the lecturer where they were able to prove their worth.

Not only did M interact frequently with the students, he also supported their interactions with each other through the design of the learning activities. As a result, the students worked collaboratively in face-to-face groups, and helped each other collect visual evidence of their skill development. They also interacted online when using Facebook for their ePortfolios and gave each other feedback. In other words, a supportive learning community, facilitated by M, was created over the 12 weeks of the research project (CSF 3). Therefore, interactions and supportive relationships gradually developed amongst students and with the lecturer. It makes sense that interaction with others is an important predictor of student engagement because it takes time and enthusiasm to participate actively in collaborative learning processes (Gourlay, 2017; Tarantino et al., 2013). Also, the high level of encouragement by M and the frequency of his interactions as well as his competence with the technologies would no doubt have contributed to the students' positive experience and their engagement (Tarantino et al., 2013). Furthermore, the teacher is considered paramount to transactional engagement where learning is active and collaborative and heralded by meaningful interactions (Zepke & Leach, 2010). An overview of the key aspects demonstrated by the lecturer that influenced student engagement are shown in Figure 8.


**Figure 8. The influence of the teacher on student engagement.**

Several outcomes of the impact of the teacher on student engagement were evident in the case study. Students clearly found the choice of Web 2.0 software appropriate and it was convenient and easy for them to use their smartphones. They were confident using the applications on their smartphone devices. As a result of the technologies, they interacted with each other as part of a learning community providing feedback and guidance to each other (CSF 3). The nature of the activities and assessments also meant that interactions using social media and mobile devices were sustained amongst peers and with their lecturer throughout the timeframe of the course (CSF 6). Interactions and sharing images occurred mostly in the Facebook class group and even though not everyone commented on others' pictures, as the lecturer had hoped they would, all the students could see the feedback given by the lecturer to each person. M considered that this introduced an element of competitiveness aiding and abetting the class to lift their performance. It is also worth noting that this would also have contributed to the establishment of a learning community. M set the academic expectations and the level of intellectual challenge, and provided feedback to that end. His role in facilitating the learning process

was essential, from the support he provided in the beginning to show students how to use the mobile technologies through to the continual feedback he gave them along the way. The prompt feedback they received from M, on the images they captured for their visual ePortfolios, and that of peers, would have helped them to achieve. Also, as emerged in the interview, M believed these interactions contributed to higher pass rates.

According to M, the ePortfolios made it easier for the students to explain to others in class what they had been doing when working on building sites as part of their work experience. The transparency of the community learning process also helped the students to raise the standard of their work as they knew others, such as friends and family and builders, would see their ePortfolios. The sharing aspect also contributed to the development of a collegial learning community, where honest feedback could be given and received in a trusting and interactive environment (Mindich & Lieberman, 2012). All these aspects fit neatly within Cochrane's (2014) six critical success factors, indicating the importance of M's role in the facilitation and design of the learning process (see Figure 8).

The factor of academic challenge was dependent on M's input, and he believed this came about in several ways: students had to use mobile technologies, unfamiliar to them in a learning context, to create ePortfolios that met specific assessment standards. Also, the learning tasks involved reflection which requires cognitive processing, and is therefore, associated with deep learning, and they had frequent interactions with their lecturer and peers when feedback was given on their work. Academic challenge is acknowledged as an important benchmark influencing student engagement (Evans et al., 2015; Grier-Reed et al., 2012; Zepke & Leach, 2010). Additionally, the strong presence of M in the learning process contributed to their intellectual experience and would be regarded as transactional engagement because the students were challenged academically through their interactions with M (Zepke & Leach, 2010). Feedback is considered an important component for encouraging engagement (Evans et al., 2015; Grier-Reed et al., 2012), and particularly valuable when students are exposed to higher levels of academic challenge (Evans et al., 2015). Thus far, evidence for factors such as academic challenge, collaboration, curriculum and learning design, facilitation and interactions has been discussed (see Table 3). Further attention is given to the impact of the teacher on student engagement.

## *The Influence and Role of the Teacher*

M was a teacher with a positive attitude to using mobile technologies and high "teaching self-efficacy," as described by MacCallum et al. (2014), and was well-placed to introduce learning and assessment approaches that utilized the students' smartphones. A confident teacher was considered more likely to adopt new technologies, especially when the benefits for learners were recognised (MacCallum et al., 2014). Fortunately for the students, M was confident enough to explore technologies that would be appropriate and try them out beforehand, selecting applications that he believed would be suitable. By selecting an application that he knew his students were already using, and getting them to use smartphones that they owned, he was acknowledging their existing knowledge and interest in Web 2.0 technologies. M also recognised that students already had some confidence in using these technologies, and had a positive attitude towards them. Certainly, his belief that his students would be more motivated using what was familiar and relatively easy, appeared to bring results, with the majority of students stating they were confident in using the three applications he trialled (Facebook, Evernote & G+), and in agreement that they were accessible and easy to use. The experience of the students was enhanced, they said, because their lecturer made sure to spend time demonstrating each application before they had to use it, carefully scaffolding their learning with tasks that were manageable. When lecturers are knowledgeable about the use of educational technologies, students tend to be more positive about its integration in their classes (Dahlstrom, 2015), and are also more likely to engage in the learning process when they have a positive outlook towards using technologies (Heflin, Shewmaker & Nguyen, 2017), and feel adequately prepared (Dahlstrom & Bichsel, 2014).

M incorporated social media in the learning process to encourage student-centred learning, autonomy, self-regulation, collaboration and fruitful interactions, and all these aspects are known to promote engagement (Dabbagh & Kitsantas, 2012; Johnston, 2016; Rutherford, 2010; Tarantino et al., 2013). Unlike educators who perceive that cell phones would cause distractions, and could have a negative impact on learning (Duncan et al., 2012; Johnston, 2016; Thomas & O'Bannon, 2013), M's attitude to cell phone technology in the classroom was supportive and students were able to bring their smartphones to class and use them for specific activities. Teachers tend to ban cell phones or other mobile devices, such as laptops, from the classroom when they lack confidence in using the technologies, are unsure how to design learning tasks using them, and have no motivation to incorporate them in learning and teaching (Tarantino et al., 2013). As teachers feel more comfortable with using mobile technologies in their teaching, their benefits for learning are being recognised (Thomas & O'Bannon, 2013). Furthermore, teachers that receive pedagogical support when trying new technologies are also more likely to change their attitudes towards a more learner-centred design, and embrace the use of mobile devices in class (Cochrane & Antonczak, 2015). M was supported in this way during the Action Cycles, and this would have assisted him in a positive teaching experience.

Due to M's desire to implement an innovation using mobile technologies, his students were able to freely record themselves learning the practical carpentry skills, both on-site in the workshop, during the on-site house build and when off-site on work experience. The single student without a smartphone was still able to capture his work visually and students helped each other take images. This peer support was possible because the students worked together in collaborative groups when practising the technical skills. This approach is similar to the transformational learning approach used by Cochrane and Antonczak (2015) during a design degree elective where students also used social media apps on their smartphones to create visual portfolios. Although, in that situation, students collaboratively created videos rather than images, and used apps more suitable for those activities.

Similarly, M began the class activities using a structured pedagogical approach, and then guided his students in self-directed learning activities where they could decide how, when and where to gather evidence for their ePortfolios. Also, by the end of the fourth Action Cycle in this study, M's students were participating in a learning community and working more independently of the lecturer. Therefore, M was able to move his students through two stages of learning in Cochrane and Antonczak's (2015) PAH framework: from pedagogical reliance on him, through to self-direction where the students organised their learning (andragogical), with some autonomy in the process. Complete independence and self-management of the learning process was not possible due to the nature of the prescriptive assessment tasks, therefore, the third phase of PAH, heutagogy, was not accomplished.

Even though M directed which skills the students had to record, they were able to use their creativity in capturing them, and in how they were organised for assessment. Furthermore, students using smartphones to visually record the achievement of skills was an empowering way to use mobile devices for learning (Marti & Ferrer, 2012). One could also argue that it was an authentic and efficient way to be assessed. The approach also encouraged collaboration amongst peers, at least while they were gathering evidence, even if their interactions using the ePortfolio applications later on were minimal. The efficiencies of the method for assessment, meant that the lecturer did not have to be in the same place as every student and watch them undertake every skill to tick them off on a checklist. The ePortfolios the students produced, depicted skill acquisition at various points during the learning process, and represented an authentic record for assessment. "... authenticity in assessment is based on the idea that a more representative evaluation of a student's learning is based on evidence that represents a reflective, intentional timespan rather than arbitrary points in time" (Buyarski & Landis, 2014, p. 50). M was particularly pleased with the visual records of students' work experience as this provided a more accurate and authentic record of their technical skill development. He cared about the students' success, and facilitated an experiential process that helped to accomplish this.

## *Responses of Students*

Overall, the students in this study were positive about using mobile social media technologies and satisfied with using smartphones and apps to create their ePortfolios. They considered the mobile learning option to be more convenient and easier. Also they were interested in creating electronic portfolios to showcase their technical carpentry skills for assessment, and were happy to use their smartphones for capturing photographic evidence. Similarly, Marti and Ferrer (2012), when investigating how postgraduate teacher education students used their mobile phones to create audio-visual evidence for their ePortfolios (blogs), found that participants had a positive outlook to the experience. Positive attitudes for both learning and using technologies and active participation are considered to be attributes associated with engagement (Chapman, 2003; Heflin et al., 2017; Kuh, 2002). M observed these attributes in his students, including: the way they worked together, how they organised themselves to collect visual evidence, their motivation to complete the assessment tasks, their confidence with the technologies and their willingness to try them.

The applications that students used to capture their skills provided a record of their work and one that could be shared (apart from Evernote). At the same time, the approach supported the development of digital skills, and such use of social media for collaborative activities has been shown to contribute to digital capability which manifests in higher self-efficacy for using technologies (Evans et al., 2015; Hegarty et al., 2010; Jeffrey, Hegarty, Kelly, Penman, Coburn, & McDonald, 2011). Functionality of the apps was important to the students as they needed to be 'fit for purpose', thus contributing to enjoyment of the process. Although, G+ caused some problems when used on students' smartphones, they still managed to create their ePortfolios using their laptops or desktop computers. More immediate access to the platform from their smartphones to upload their photos directly, if Wi-Fi was more reliable, would have enhanced the sustainability of the application. Just over three-quarters of the students were easily able to access the applications and were confident in using them, particularly after M had shown the group how to use each one to create their ePortfolios.

Not surprisingly, more than half the participants found the learning experience, using their smartphones, was enjoyable, interesting and fun. Enjoyment and interest in a learning task, reasonable challenge and self-efficacy developed through successful cognitive achievements are known indicators of engagement (Chapman, 2003; Karim & Behrend, 2013). Also, when learners undertake challenging activities with attainable goals, they tend to attribute high value to the learning, and this intrinsically motivates them to perform well and results in perceived higher engagement (Evans et al., 2015; Schweinle & Helming, 2011). Additionally, being formatively assessed during group activities and assessed using portfolios has been associated with enhanced deep learning by students (Baeten, Kyndt, Struyven, & Dochy, 2010). Deep learning opportunities are reliant on learning design provided by teachers, and as such contribute to student engagement.

The ePortfolio approach also meant that students could take ownership of the images capturing their skills and competencies, and subsequently of the ePortfolios they created. Being in charge of the learning process, the evidence being produced and the vehicle for assessment is immediately a more student-centred dichotomy and aligns with an environment that supports deep learning, authenticity and engagement (Barrett, 2007). The learning environment created by M also provided an opportunity for the students to receive concrete formative feedback in the form of text comments regarding what was captured in the image, and retain this in the mobile ePortfolio application in use at the time. This allowed the students to return to their work and the lecturer's comments again and again for review, thus encouraging reflection about their achievement or need to improve. Electronic portfolios and reflective learning through all stages - capturing evidence, compiling artefacts and presentation of evidence - tend to go side by side, and hence the use of portfolios for assessment encourages deeper approaches to learning (Barrett, 2010).

As mentioned previously in the literature review, the role of the teacher is essential to engagement in learning. The teaching methods and learning strategies that were designed in this research study de-

pended on M's knowledge of his students, sound pedagogy and also his ability and confidence in using technologies suitable for mobile devices. M had regular and consistent interactions with his students throughout the 12 week course. His students indicated in the post-survey and the focus group discussion that they found his instructions clear and helpful and his guidance made it easy and comfortable to complete the ePortfolios. M's teaching methods appear to have engaged the students since creating an ePortfolio for assessment not only helped them to learn but also increased their confidence in using mobile technologies. M also reported that students asked him questions more often, collaborated at a higher rate and participated more actively in this class compared to others where mobile technologies were not used. Students appreciated the mobility of the learning strategies and considered it to be a convenient way to learn.

## *Student Engagement in Learning*

The design of learning activities using mobile devices is considered essential if significant learning is to occur, and accordingly needs to take into account features that enhance mobility, collaboration and communication amongst students (Heflin et al., 2017). Small group peer interactions and accountability for completing tasks are regarded as necessary for engagement and successful outcomes (Heflin et al., 2017). In the current research study, students had deadlines for completing assessments and not only assisted each other to take photos but also commented on each other's work. They also had to help each other to use the applications to complete the tasks, and relied on feedback from the lecturer. Since interaction occurred in several different ways (with the applications, between students and with the lecturer) it appears to have been a strong influencing factor, and is known to be linked to engagement in learning (Cochrane & Antonczak, 2015; Zepke & Leach, 2010).

The outcomes of this research study indicate that the students were clearly participating in "educationally purposeful activities", another indicator associated with student engagement (Grier-Reed et al., 2012, p. 86). The visual ePortfolios they compiled for assessment attracted success and they passed several unit standards (as depicted in Figure 3). When considering whether the student engagement construct used in this article aligns with that used by Grier-Reed et al., (2012) (based on Chickering and Gamson's (1987) principles of undergraduate education that are used for established engagement questionnaires), several principles emerge as important. Namely: interaction between the lecturer and the students, peer cooperation (collaboration), active learning techniques, communicating high expectations and prompt feedback mainly from the lecturer but also from other students. Success in study is another indicator of student engagement (Grier-Reed et al., 2012). Although, attributes of student engagement are not the focus of this paper, the data indicates that several of these were manifested by students (e.g., autonomy, active participation, interest, enjoyment and positive attitudes to learning), therefore, using strategies that encouraged students to develop these were important within the learning process.

In summary, the influence of the teacher (M) was pivotal to the learning approach using mobile technologies, from initial conception and the design of the learning activities and tools through the process, where he supported and facilitated students with his enthusiasm and care giving consistent formative feedback, through to their submission of assessment ePortfolios. Student achievement rates increased and they enjoyed and participated actively in the process. M provided interesting learning design that enhanced academic challenge and meaningful interactions in a collaborative, peer learning community. The learning environment he created with the students was designed to be inclusive and although issues with reliable Wi-Fi access caused somewhat of a barrier, alternative means could be used to complete the assessment tasks. As a result of the experiential tasks using mobile learning within an action research process, the lecturer changed how he approached learning design and guided his students' learning, subsequently transforming his professional teaching practice.

## LIMITATIONS AND FURTHER RESEARCH

The sample size was relatively small with 15 students taking part in the learning activities. Since only eight students responded to the pre-survey, the demographic data gathered therein is not representative of the group, and it was not clear how many of the 13 responding to the post-survey had also contributed to the initial survey. Therefore, connections could not be made regarding mobile device ownership, and the type of learning activities students had undertaken using them, before taking part in this research study.

In this research, established methods of measuring student engagement using questionnaires were not used, and along with the small sample size, this means that the findings cannot be generalized to other contexts. Even so, the case study could be used to inform teaching practice and other research in the area of mobile learning and student engagement, and interpretation and application is dependent on specific contexts.

Further research is needed to measure the impact of factors associated with student engagement, student-centred learning and the alignment with 21st Century teaching and learning methods and contemporary technologies. Work is also needed to examine the implications of student engagement measures as predictors of excellence in teaching, and in the development of learner capability (critical thinking, social justice awareness, reasoning, reflective practice, sustainability, cultural competence, individual well-being and high self-efficacy in digital information literacy etc.).

## CONCLUSION AND RECOMMENDATIONS

Participatory Action Research was a suitable methodology for investigating the research questions due to the nature of the learning strategies implemented with students and the need for a dynamic response as the project progressed. Each Action Cycle occurred over a three week period using a different mobile application, culminating in a fourth cycle where students were given free choice. The majority of students enjoyed using their smartphones, and found Facebook and Evernote the easiest applications to access and use for creating visual electronic assessment portfolios. The opportunity to collaborate and share images showing their attainment of technical carpentry skills facilitated regular interactions both with each other and with the lecturer. Also the process was student-centred and encouraged peer feedback. The use of BYOD enabled more independence and flexibility during the learning process and acknowledged students' existing knowledge of their devices, and digital aptitude.

Several factors impacting on student engagement were associated with the role of the lecturer during the experiential activities and action research process (e.g., academic challenge, collaboration, curriculum and learning design, facilitation and interaction). The students regarded M as an approachable and supportive lecturer because he provided clear instructions for using the applications, and gave regular and prompt formative feedback during the learning process. The input of the lecturer was vital to the learning process and corroborates what other researchers have concluded regarding student engagement.

The sample size of 15 students was small, and the design of the study was intended for a specific learning and teaching context, therefore, it is not possible to generalize the results. Even so, other practitioners may find the findings useful and be able to apply some aspects to their teaching. The following recommendations may be helpful.

When designing learning strategies for learning using mobile technologies, teachers are advised to:

1. conduct a needs analysis to assess the mobile devices students prefer to use for learning, ascertaining the suitability of the approach;
2. involve students and other stakeholders, for example, the organisation and industry employers;

3. access expert technological and pedagogical assistance and support;
4. refer to Cochrane's (2014) six critical success factors when designing the learning environment;
5. provide adequate resources and support to learners;
6. take into account the factors that influence student engagement; and
7. use strategies that encourage students to develop attributes associated with engagement (e.g., autonomy, active participation, interest, enjoyment and positive attitudes to learning).

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# APPENDICES

## *APPENDIX A: PRE-SURVEY*

Q1 Thank you for your interest in taking the survey. This survey is collecting baseline information for a research project called: Integrating mobile learning strategies and devices into learning and teaching at Otago Polytechnic. As part of this research project we would like to find out what sort of mobile devices you own, and how you currently use them both personally and in your studies. This will assist with developing the right formats for you to access mobile learning resources, as well as enable a snapshot of how mobile devices are used. Throughout the survey, information and definitions are provided to help you to answer the questions.

Q2 How do you define mobile devices? Mobile devices - are defined by Wikipedia as small, handheld computing devices, typically having a display screen with touch input and/or a miniature keyboard. They can run various types of application software, known as apps. Most handheld devices can also be equipped with Wi-Fi and some with 3G or 4G telecommunication technologies for enabling access to the Internet (Wikipedia, 2014). For this research, laptops are also regarded as mobile devices. Mobile learning – "Any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies" (Wikipedia, 2011).

**Demographic Information**

Q3 Which age group do you belong to? Please select one answer

- ❍ Less than 20 years (1)
- ❍ 20-29 years (2)
- ❍ 30-39 years (3)
- ❍ 40-49 years (4)
- ❍ 50-59 years (5)
- ❍ 60+ years (6)

Q4 Which ethnicity group do you identify with? Select the answers that apply to you

- ❑ NZ European (1)
- ❑ Maori (2)
- ❑ Pacific Peoples (3)
- ❑ Asian (4)
- ❑ Other ethnicity (please specify) (5) _____

Q5 I identify my gender as.....

Mobile Phones Smartphone - a mobile phone with a large format touch screen that can run a range of applications (apps) like a computer and has the capability to access the Internet through your phone provider or Wi-Fi. Android operating system - produced by Google and based on Linux; uses open source products.

Q6 Do you have a mobile phone?

- ❍ I don't have a mobile phone (1)
- ❍ I have a basic cellphone (2)

- I have an Apple iPhone (3)
- I have a Google Android smartphone (4)
- I have a Windows smartphone (5)
- I have a Blackberry phone (6)

Q7 Who is your mobile phone service provider?

- Vodafone (1)
- Spark (previously called Telecom NZ) (2)
- Skinny Mobile (3)
- 2 Degrees (4)
- Other (please specify) (5) _____

Q8 How are you charged for your mobile phone service?

- I use prepaid top-ups or value packs (1)
- I am billed monthly by my phone service provider (2)
- My employer pays the bill (3)

Q9 How long have you had your current phone?

- Less than 12 months (1)
- 1-2 years (2)
- 2-3 years (3)
- 3 years or more (4)

Using the Internet on your phone Wi-Fi - wireless technology that enables an electronic device to exchange data or connect to the Internet. 3G or 4G - mobile telecommunications technology enabling access to the Internet.

Q10 Is data included in your mobile phone service?

- I don't have data (1)
- 250MB or less (2)
- 500MB (3)
- 1GB or more (4)
- I have data but I don't know how much (5)

Q11 How do you access the Internet and/or Internet-based apps on your phone? Please select the main statement that applies to you:

- I never access the Internet on my phone (1)
- I use both mobile data and Wi-Fi connections equally on my phone (2)
- I am careful how I use my mobile data (3G or 4G) (3)
- I freely use mobile data (3G or 4G) (4)
- I prefer to use Wi-Fi connections rather than mobile data (5)
- I only use Wi-Fi connections to use the Internet on my phone (6)

Q12. What applications (apps) or sites do you use daily on your phone? Please list up to 5 (with those you use most first) and for each state how you use it for your studies and/or personally. FOR EXAMPLE: 1. Facebook - use mainly socially, but also as a study group for 2 of my courses2. Camera - take photos for workbook for course study or assignments; and use to record people/places/events3. Google Chrome - use to browse for information both for class and personal use (e.g., looking up store information)4. Evernote - use to keep notes on ideas for study when out and about5. Runkeeper - for personal use to keep track of my exercise

Tablet devices Tablet - a small hand held, flat computer device that is primarily operated by touching the screen. Includes iPads and other devices. They can have an Apple (iOS) or an Android operating system.

Q13 Do you have a tablet device? Check those that apply

- ☐ I don't have a tablet (1)
- ☐ I have an Apple iPad (2)
- ☐ I have an Android based tablet (3)
- ☐ I have an Amazon Kindle (4)
- ☐ Other (please specify) (5) _____

Q14 How long have you had your tablet for?

- ○ Less than 12 months (1)
- ○ 1-2 years (2)
- ○ 2-3 years (3)
- ○ More than 3 years (4)

Q15 I access the Internet on my tablet through.... (please select the appropriate answer)

- ○ a Wi-Fi connection (1)
- ○ a 3G connection (2)
- ○ both Wi-Fi and 3G connections (3)
- ○ I can't access the Internet on my tablet (4)

**Using your tablet**

Q16 I use my tablet... (please select the answer that applies)

- ○ Multiple times a day (1)
- ○ Once a day (2)
- ○ Once every few days (3)
- ○ Once a week (4)
- ○ Once a month (5)
- ○ Other (6)

Q17 Do you take your tablet with you to use for your learning at Otago Polytechnic? If you don't, please give a brief reason why not.

- Yes (1)
- Sometimes (2)
- No (3) _____

Laptop computers

Q18 Do you have a laptop computer?

- Yes (1)
- No (2)

Q19 I use my laptop... (please select the answer that applies)

- Multiple times a day (1)
- Once a day (2)
- Once every few days (3)
- Once a week (4)
- Other (5)

Q20 How long have you had your laptop for?

- Less than 12 months (1)
- 1-2 years (2)
- 2-3 years (3)
- More than 3 years (4)

Using your laptop computer

Q21 Do you take your laptop with you to use at Otago Polytechnic? If you don't, please give a brief reason why.

- Yes (1)
- Sometimes (2)
- No (3) _____

Q22 When you take your laptop to polytechnic do you log into the Otago Polytechnic Student Wi-Fi?

- Yes (1)
- No (2)

What activities do you use your devices for?

Q23 Please select the activities or tasks for your studies that you currently do using each of your devices (Check all that apply)

| | Smartphone (1) | Tablet (2) | Laptop (3) |
|---|---|---|---|
| Not applicable ( I don't own this device) (16) | ❑ | ❑ | ❑ |
| Accessing course materials or discussion forums on Moodle (1) | ❑ | ❑ | ❑ |
| Downloading resources (2) | ❑ | ❑ | ❑ |
| Listening to audio or podcasts (3) | ❑ | ❑ | ❑ |
| Note taking (4) | ❑ | ❑ | ❑ |
| Searching for information on the Internet (5) | ❑ | ❑ | ❑ |
| Searching library catalogues or databases (6) | ❑ | ❑ | ❑ |
| Uploading materials (7) | ❑ | ❑ | ❑ |
| Watching videos (8) | ❑ | ❑ | ❑ |
| Web conferencing (e.g., Skype or Adobe Connect) (9) | ❑ | ❑ | ❑ |
| Writing assignments (10) | ❑ | ❑ | ❑ |
| Writing emails (11) | ❑ | ❑ | ❑ |
| Other (please state) (12) | ❑ | ❑ | ❑ |
| None of the above (13) | ❑ | ❑ | ❑ |

**Mobile devices and confidence using them for learning**

Q24 I enjoy learning to use new programs or features on my mobile device(s)

- ❍ Strongly Agree (1)
- ❍ Agree (2)
- ❍ Neither disagree nor agree (3)
- ❍ Disagree (4)
- ❍ Strongly Disagree (5)
- ❍ Not applicable (6)

Q25 Please explain the reason for your answer above

Q26 I am confident learning to use new programs or features on my mobile device(s)

- Strongly Agree (1)
- Agree (2)
- Neither Agree nor Disagree (3)
- Disagree (4)
- Strongly Disagree (5)
- Not applicable (6)

Q27 Please explain the reason for your answer above

Q28 I need help to use my mobile device(s) for learning

- Strongly Agree (1)
- Agree (2)
- Neither Agree nor Disagree (3)
- Disagree (4)
- Strongly Disagree (5)
- Not applicable (6)

Q29 Please explain the reason for your answer above

You are at the end of the survey. > Are you happy with your responses? If you want to change anything, click "Back" to go back. > If you are happy with your responses please click "Next" to submit the survey. Thank you. We really appreciate your contribution.

## *APPENDIX B: POST-SURVEY*

Integrating mobile learning strategies and devices into learning and teaching at Otago Polytechnic. Please answer the following questions about your experience of using mobile devices to create ePortfolios

Q1 The experience was enjoyable and fun

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Q2 I felt confident using these platforms

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Q3 The lecturer's instructions for using the applications (Facebook, Evernote and G+) were clear and helpful

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Q4 Please comment on how well you were able to carry out the instructions

Q5 The applications were easy to access and use

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Please explain why

Q6 Creating an ePortfolio helps me to learn

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Please explain why

Q7 It was easier to use a mobile phone for the ePortfolio

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Please explain why

Q8 Mobile learning made my learning more interesting

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Please comment on your experience of mobile learning

Q9 Developing the ePortfolio has helped me connect with others in the class

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Please comment on your experience using the applications

Q10 Which platform did you prefer?

- Facebook
- Evernote
- G+

Q10 Any other comments?

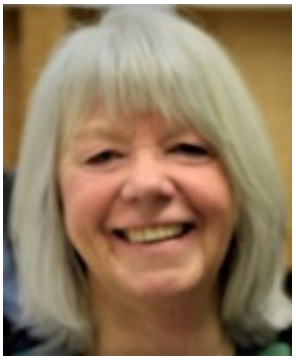
## *Appendix C: Focus group questions*

1. Could you see the benefits of making the ePortfolio mobile?
2. How does the mobile ePortfolio compare to using Powerpoint?
3. Which platform did you prefer and why?
4. What other platforms could be used for communication or ePortfolio?
5. Did you have any difficulties uploading material - software or wifi issues?
    a. How did you solve them?
6. What other mobile technologies could the lecturers use to help you learn?
7. To help you to create contacts earlier on in the course, how would a Facebook page or other social media help?

## *Appendix D: Individual Interview questions*

1. Why was it important to use mobile portfolios? Why did you decide to use mobile eportfolios?
2. How did you decide on the platforms?
3. How did you feel it went?
4. How did it help your teaching and why?
5. What now? Changes or improvements.

## Biographies



**Dr Bronwyn Hegarty** is Programme Leader of the Graduate Diploma in Tertiary Education and Principal Lecturer, supporting tertiary teachers to develop their teaching practice. For her Doctorate in Education she developed a Three-Step Reflective Framework to guide professional learning and reflective practice. She continues to use this in her teaching. Bronwyn has a health and a science background, and has previously worked as an educational developer supporting teachers with elearning, open educational practices and educational technologies. Her research interests include mobile learning, ePortfolios for reflective practice and vocational pedagogies.

**Matt Thompson** is a Principal Lecturer in the Carpentry department at Otago Polytechnic where he works with both fulltime students and apprentices on the construction programmes. His teaching passion stems from seeing students succeed using ePortfolios for assessment and reflective practice. His research interests centre on mobile learning using ePortfolios for assessment and the use of online platforms to assist apprentice carpenters to record their practical work based learning.