

New tools and techniques for learning in the field: studying the built environment

Project: ID11-2011

Final Evaluation Report

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Evaluator: Dr Inger Mewburn

Director of Research Training

Australian National University

Inger.mewburn@anu.edu

Ph: 0417 348 083

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The Project

The **New tools and techniques for learning in the field: studying the built environment** project sought to investigate the potential for new forms of field-based learning in university education.

The project took advantage of recent advances in mobile digital technology to develop a number of digital solutions to address contemporary learning and teaching needs in field-based education.

The project has developed field exercises for use on mobile tools (chiefly smartphones and tablets) and is documented in the form of four case studies, which outline the designing, building and evaluating of heuristic tools to assist field based learning activities.

A website has been developed to present the project's four case studies as models for activity development with accompanying general guidelines for mobile-supported fieldwork.

<http://mobilefieldworklearning.wordpress.com>

Dissemination of the project has included:

- Three presentations have been made at the following conferences: the *Annual Conference of the Society of Architectural Historians of Australia and New Zealand* (SAHANZ); the *International Conference of the Future of Education* and; the *Annual Conference of the Australasian Society for Computer Learning in Tertiary Education* (ASCILITE).
- A journal article has been published in *Architectural Research Quarterly*
- The project team facilitated five seminars with a range of research groups and teaching and learning interest groups.
- A National Workshop was held in November 2013, which acted as a forum to present the project cases with similar work by other teachers and researchers, with an audience of 30 people from 7 Institutions.

Forthcoming dissemination of the project:

- A new project website is being designed to replace the older site <http://mobilefieldworklearning.wordpress.com/>
- One further publication is in press and should be published in 2014

Project team members include:

Associate Professor Hannah Lewi (Leader)

Dr Wally Smith (Leader)

Dr Andrew Saniga and Dr Shanton Chang from The University of Melbourne

Associate Professor Lee Stickells from The University of Sydney

Associate Professor Diego Ramirez-Lovering from Monash University.

The project officer was Dr Dora Constantinidis.

The evaluator, Dr Inger Mewburn is an expert in architectural education and has taught in the discipline for over 12 years. She has also practiced as an architect. Dr Mewburn publishes on architectural learning and teaching, and academic use of social media and digital tools. Her PhD investigated embodied aspects of design education in the form of a study of gesture behavior with architectural representations and tools of the trade. Currently she is researching digital tools that respond to the demands of post-graduate research training in her role as the Director of Graduate Training at the Australian National University.

Dr Mewburn was assisted in the preparation of this report by Megan McPherson, (RMIT and Monash University). Her extensive experience in learning and teaching in the art and design studio, academic development, and project management, including the dissemination and evaluation of research projects in learning and teaching has informed and supported the summative evaluation reporting.

This evaluation report is a summative assessment to the extent to which the **New tools and techniques for learning in the field: studying the built environment** project operated as planned and achieved the project aims, outcomes and deliverables.

Evaluation Methods

This project was designed with an evaluation framework of three stages. Below is an outline of this framework, extracted from the original project proposal:

- (i) Within-study evaluation of learning outcomes achieved through new fieldwork tools and techniques.** Each study will evaluate the effectiveness of the use of new fieldwork activities through a suite of evaluation techniques including:
- i) observation of students performing learning activities with mobiles;
 - ii) in-depth interviews with a sample students to assess their understanding of discipline concepts and the ways and extent to which this understanding builds on the experience of the field exercises undertaken;
 - iii) questionnaire surveys of all participating students for general appraisal of the viability of the field work techniques deployed;
 - iv) in-depth interviews with staff and tutors in the subjects to determine the application of the fieldwork approach to their particular learning objectives.

The primary evidence to be collected will therefore be qualitative evidence about the kinds of student experience and learning. Through the questionnaires that probe explicit elements of curriculum and the fieldwork component, we will also conduct a quantitative assessment of what students learn and retain. Smith and Chang have extensive experience in conducting evaluations with various stakeholders around learning and the role of new technology.

- (ii) Project-wide evaluation of guidelines.** Our research design (shown in Figure 1) is intended to provide insights into how well our guidelines for mobile learning activities can be applied from one context to another. Study 1 and Study 2a will lead to the formulation of guidelines. The application of this first version to the subsequent Study 3, Study 4 and Study 2b will provide a basis to judge the suitable form of guidelines leading to a revised version.

In addition, the findings of the project will also undergo continual evaluation from an early stage through the external Reference Group (as described above).

- (iii) External evaluation.** An academic in with experience in fieldwork learning will be recruited from outside of the partner institutions to conduct a review of the project in the second year.

As the external evaluator was recruited towards the end of the second year of the project, the final evaluation report is a summative report that draws together the data collected during the formative project evaluation and project process.

This report assesses the merit and worth of the project, therefore it is focused on how this project, met the aims stated by the project team. This evaluation report addresses the key evaluation questions by examining:

- 1) Implementation, design and delivery of the project and if this was carried out as planned and funded, by evaluating the project aims to its outcomes and deliverables.
- 2) The effectiveness of the dissemination strategy
- 3) The stated and implied benefits of this project for the field of design education.

At the end of this report we include suggestions for further work aimed at assisting the OLT, and interested others, to leverage the outcomes of this project.

Evaluation Approach

The evaluation methodology was designed as a summative evaluation of the project by selectively documenting key aspects of the project and assessing the extent to which it reached its aims, deliverables and outcomes. The critique is focused on the merit and worth of the project within the context of learning and teaching in design education and the use of digital tools in learning and teaching fieldwork instances. Accordingly, the evaluation focused on the project's processes and the timely outcomes and deliverables (see Appendix 1 for further detail), as well as the longer-term implications for field-based teaching and learning in design education and the trans disciplinary potentials.

The evaluation plan is based on an interactive method of examining project outcomes and deliverables, the dissemination plan and artifacts, and the project's process data, such as minutes of meetings (Mertens & Wilson, 2012; Chesterton & Cummings, 2011). The evaluation (see Appendix 2 for further detail) has also utilized participant evaluative feedback collected by the project over time, and a questionnaire administered by phone and email with the research team (see Appendix 3 for further detail). We are satisfied this approach enabled us to assess the extent that the project's deliverables and outcomes have been achieved.

Recommendations for improving subsequent offerings of the program have been developed from this analysis.

Evaluation Key Questions

- To what degree has the **New tools and techniques for learning in the field: studying the built environment** project been implemented as planned and funded?

- To what extent are participants satisfied with the design and delivery of the **New tools and techniques for learning in the field: studying the built environment** project?
- To what degree has the model guidelines for **New tools and techniques for learning in the field: studying the built environment** project been developed?
- To what extent have the **New tools and techniques for learning in the field: studying the built environment** project stated outcomes been achieved?
- What, if any, unintended outcomes have been identified?
- What are the limitations of the **New tools and techniques for learning in the field: studying the built environment** project?
- How might future **New tools and techniques for learning in the field: studying the built environment** project be improved?

Data Collection and Analysis Processes

The evaluation of this project is improvement orientated; it documents the processes undertaken and is an accountability-focused appraisal of the project. The evaluator collected responses from the research team using a transparent process in line with the Guidelines for the Ethical Conduct of Evaluations approved by the Australasian Evaluation Society (see <http://www.aes.asn.au/about/>).

The evaluator used her extensive knowledge and experience of the discipline of design education, in particular the history and current practices, to contextualize the deliverables and outcomes of this project.

There were two main forms of data used to produce this report:

Document and artefact review:

The Evaluation document review included the study and analysis of key documents related to this project including the draft of the final project report, various workshop flyers and the website <http://mobilefieldworklearning.wordpress.com>. The evaluator also had extensive access to one of the iPad 2 used by students with some of the project software installed on it so she could gain an experiential understanding of the tools that had been developed.

Stakeholder/Participant Perceptions:

The evaluator administered a short questionnaire, by email and phone, to members of the research team and selected members of the invited review panel. The interviews were used to explore participants' views on project successes and limitations of the project that may affect the sustainability and further implementation of the project. The interview questions were guided by semi-structured protocols developed by the Evaluator. The questionnaire explicitly addressed the key evaluation questions and the responses to the questionnaire were analyzed to examine if any themes emerged.

Evaluation Deliverables

Final Evaluation Report by the external evaluator was completed in April 2014

Meeting the Project Aims and Deliverables

This section explores the implementation, design and delivery of the project and if this was carried out as planned and funded, by comparing the project aims to its outcomes and deliverables.

The project's stated aims in the proposal were to enhance and extend the practice of field-based teaching by investigating and evaluating new techniques for student field exercises. To this aim, the project set out to explore new ways of mobilising field-based learning within design education, as the catalyst for innovation. This project was characterised by an action research approach, using four case studies to test prototypes and refine the tools and research questions. The project aims and deliverables from the original proposal were as follows:

To conduct four inter-related but distinctive studies that evaluate a range of innovative techniques for fieldwork in the Built Environment. These techniques will draw on readily available mobile technology to create appropriate digital learning tools. The techniques and their supportive tools will address: the structure of mobile learning activities, the design of mobile learning materials and instructions, the design of mobile assessment tasks, greater integration of field activities into class-room teaching, and student creation of mobile content.

Four case studies are summarized in the tables below and followed by a short commentary.

Proposed Study 1. Physical site analysis (Monash)

Context: ARC3101 'Technologies and Environments 3' is a core subject of the Bachelor of Architecture at Monash University. It includes the study of environmental design principles and the implications of these in relation to architectural design, construction and sustainability.

Aim: To examine how students learn to identify and collect specified data about physical site conditions, including natural lighting levels, wind patterns, temperatures etc.

Techniques and Tools: The focus of this investigation will be on:

- The design of complex instructions, delivered *in situ* through a mobile tool, to complete data collection tasks with feedback in situ on performance
- Sharing and comparing data collected on site to appreciate its variance, accuracy and reliability.
- Distributing measurement tasks within groups of students to promote social learning.
- Structured assessment and tutorial exercises focused on findings derived from the mobile.

Actual case study outcomes

Case 3. Environmental Measurement

<http://mobilefieldworklearning.wordpress.com/case-3-environmental-measurement/>

Proposed Study 2 a & b. Student production of a glossary of urban design concepts (Sydney)

Context: ARCH9062 *'Urban Design Ideas and Methods'* is a subject in the Master of Urban Design and Master of Architecture at The University of Sydney. It familiarises students with key conceptual models and theories that have influenced urban design practice.

Aim: To examine how students develop text and graphical materials, for a mobile medium, that define key urban design concepts and theories, and link those concepts with a local environment that manifest their qualities.

Techniques and Tools: The focus of the investigation will be:

- Part 2a. Assessment of the feasibility and effectiveness of students producing a package of content for a mobile device. Over the semester, students will produce and gather raw digital content (text, images, videos, audio) for a mobile guide to urban design concepts.
- Part 2b. Subsequent classes will use the guide and augment its content.
- Investigation of the effectiveness of the 'glossary' to guide and develop students' understanding of urban design concepts and selected landscapes *in situ*. This will involve developing and testing text, image and diagram assemblages readable in small-scale digital formats that can be analysed while moving around in the field.
- To provide an academic forum for discussing and critiquing the relatively new forms of 'mobile media guides' – audio tours, self-guided GPS tours, multi-media maps, etc – and assessing their value in University-based education.

Actual case study

Case 4. Situating urban theorists

<http://mobilefieldworklearning.wordpress.com/case-4-situating-urban-theorists/>

Proposed Study 3. Comparative understanding of historic buildings (Melbourne)

Context: ABPL30053 *'Formative Histories of Architecture'* is a core subject in the Architecture major of the Bachelor of Environments at the University of Melbourne. It surveys important ideas and precedents in architecture from the Enlightenment to early Modernism, as developed in Europe, Asia and Australasia.

Aim: This study will examine how the delivery of rich images and audio accounts, and *in situ* feedback, will help students to understand the forms and origins of architectural style.

Techniques and Tools: The focus of investigation will be:

- Refining the creation and delivery of a walking tour that includes both sound narration and comparative images for each stop on a linear trail through the city of Melbourne, that includes comparative examples to other places and times.
- Experience on the practicalities of the delivery of a mobile-guide to a very large cohort of students, with particular evaluation on the advantages of university delivered devices or self-owned devices with downloadable Apps.
- The inclusion of integrated assessment and interactive tasks including Q&A, drawing and photography, and integration as a learning tool in tutorial classes.⁶

Actual case study

Case 1. Understanding Historic Buildings

<http://mobilefieldworklearning.wordpress.com/case-1-understanding-historic-buildings/>

Proposed Study 4. The interpretation of urban landscapes (Melbourne)

Context: 702-587 'History of Landscape Architecture' is a core subject within the Master of Landscape Architecture at the University of Melbourne. This subject provides a critical examination of the historical development of landscape architectural design and theory including the events, social influences and personalities involved. It addresses the formative evolutionary influences that shaped the contemporary private and public landscape. There is an extensive fieldwork component to the subject conducted in various sites in Melbourne.

- **Aim:** The fourth study will examine how the delivery of rich visual materials might promote new ways of learning how to interpret the form and experience of designed landscapes, and the history of their design and change over time.

Techniques and Tools: The focus of study will be the delivery of learning materials *in situ* at significant landscaped urban sites and will aim to:

1. Investigate the effectiveness of readily available maps, gps navigation and specifically designed maps / movement diagrams created to direct and guide students through a selected landscaped site to experience and document particular site features – both extant and visible, and less easily seen.
2. To investigate the effectiveness of delivering mixed-media resources *in situ*. In particular focusing on photographs and participatory drawing and mapping by students to understand changes in landscapes over time.
3. To evaluate the effectiveness of the digital maps in interactive group learning tasks in the field.

Actual case study

Case 2. Experiencing urban landscape

<http://mobilefieldworklearning.wordpress.com/case-2-experiencing-urban-landscape/>

This evaluative feedback below uses the numbering designated by the case study documentation:

The techniques and their supportive tools demonstrated in the four case studies address:	
Structure of mobile learning activities	
Comment	Each case study describes the way it has approached the design and development the fieldwork exercise and how this was made operational on a mobile device. The action research methodology employed by the team meant that successive iterations of the case studies continually informed the development of the mobile activities as the project progressed. In case study one, the second round of testing enabled progressive refinement of the activities enabled by the app (for instance, with the addition of the sketching activity and a quiz). In case study two, the relationship between the briefing, the activity and the assessment was improved in a way that was clearly beneficial to student learning. The collection of feedback from the students was clearly a strong driver in the development of the mobile activities and assessment. The project methodology allowed the team to pinpoint issues to do with limitations of each particular app design (especially Case Study 3). Importantly all the case studies highlighted in their findings the importance of integrating these mobile learning activities into the overall structure of the course. In this respect, case study four, where the students themselves were involved in the design of a new app, is perhaps the most developed and suggests promising directions for mobile assisted learning going forward.
Design of mobile learning materials and instructions	
Comment	Within the iterations of the Case Studies 1-4, there is evidence the research project team has agilely responded to the observed problems and student feedback, in particular by clarifying the curriculum linkages and by refocusing the experiential fieldwork activities to better align with assessment tasks and curriculum outcomes (see especially case study two and four where this aspect is most explicitly discussed, although all case studies have evidenced this process). Formative student feedback from all the case studies to fed forward into all project outcomes, most especially into the case study 4 where the team started to involve

	students in the design of apps, an activity which corresponds with the ‘qualitative’ stage of the Structure of observed learning outcomes (SOLO) model (Biggs, 1999) while the others are perhaps better understood as aligning with the quantitative stage. All the case studies incorporated various modes of experiential learning into the fieldwork-based activities, as can be seen in a comparison between case studies one and two, which involve learning from observing the environment, to case study three, which involved measuring it in order to better understand how certain environment effects are achieved. This iterative process has been fundamental to the development of the project aims to enhance and extend the practice of field-based teaching by investigating and evaluating new techniques for student field exercises.
Design of mobile assessment tasks,	
Comment	The design of mobile learning tasks has been achieved in a number of the iterations including the case studies one and two, which developed a paper workbook assessment and then a special-purpose web-app quiz, which gave immediate feedback to questions (and was found to enhance engagement for students involved in this case study). All the case studies used the fieldwork activities as a part of as assessment task. In case study four, the assessment was especially interesting and innovative as it demanded a different kind of structural engagement with the urban fabric, which gave the students space to engage in fieldwork in a less structured, yet more analytical way. This integration of fieldwork is an extension of the projects aims of investigating and evaluating new techniques for student field exercises. It develops engagement in the fieldwork activity that supports professional practice learning and later professional practice.
Greater integration of field activities into class-room teaching,	
Comment	The fieldwork activities are excellent platforms to test student theoretical learning gained in the classroom; how students are able to recall definitions, check and test knowledge in real examples are pivotal for professional practice education (Lee, Dunston and Fowler, 2012). We can see evidence of this particularly in case studies one and two, but most especially in case study three, where the results of the mobile

	– aided diagnoses of spaces could be carried back into a range of subjects in the rest of the curriculum, including structural design and materials studies. The case studies highlight where further work was needed in the classroom setting to prepare students for the fieldwork activities. In particular, they all demonstrated how mobile enhanced field-based learning could be employed to apply abstract knowledge to practical reality; promoting skills of interpretation and shifting the emphasis to student-initiated learning. As we can see in case study one and two, mobile enhanced field based learning can promote social interaction between students as a part of an overall professional learning framework. These activities don't happen by magic in either context.
Student creation of mobile content.	
Comment	As mentioned above, the project clearly showed that involving students in the process of creating mobile apps and associated content can rich learning experience which corresponds with the 'qualitative' phase of the SOLO taxonomy (Biggs, 1999). It can be extremely difficult for teachers in any setting to get students to engage in these kinds of high-level activities. As mentioned, we believe this was especially successfully articulated in Case study 4 "Situating urban theorists", where post graduate students designed content for apps with a particular theoretical context is the most obvious outcome where students created potential mobile content. Where students did sketching and data collection of photographs etc, as a part of the fieldwork activities, was another opportunity. Students created content, as images and texts, which could be shared with peers in the immediate group setting or back in the classroom.

The responses to the evaluation questions from the research team (see Appendix 3) recognized the achievement of delivering the four case studies, and the various iterations within them:

The project has been implemented and planned and funded with collaborative partnerships having been met with considerable success. The funding has enabled: collaboration among research partners and students alike; the development of iterative design and assessment processes; and, ultimately, the creation and testing of a mobile technology specifically aimed at interpreting landscape and history.

An evaluation of the project outcomes and deliverables substantiated this claim. Field-based learning has been an important component of design education since at least the 18th century (Cuff, 1991). While out in the field, design students are usually encouraged to explore, measure, critically evaluate the fabric of the built environment under the guidance of experts.

The tradition of field-based learning has been hard to sustain in the broader context of the 'massification' of higher education over the last 20 years. Simply put, field based learning is labour intensive and in an environment of ever growing class sizes, and diminishing staff resources, it is important to find ways for technology to help us maintain the quality of our curriculum. Suggestions for the optimal size of a pedagogical tour group varies; numbers between 12 and 24 people have been suggested (Holton, 1990), but there is little empirical evidence to back up these claims other than teacher 'gut feel'. First year classes at large institutions like the University of Melbourne can now number in the hundreds. In this climate, teacher led tour groups are no longer sustainable.

As far back as the early 1990s, when I began my architecture education, this massification was beginning to have an effect. In the first year I studied (1989) students were escorted around the city by staff members in large groups. The student experience of this was patchy, one learned to be near the front of the group to hear the lecturer properly. The next year lecturers acknowledged they could no longer marshal such large groups and experimented with sending us out into the city with photocopied handouts, usually consisting of a map and a series of prompts and questions, from which we were expected to construct our own learning experience of the city. This worked relatively well -- if the hand out was well constructed -- and, as far as I am aware, this has continued to be common practice to the present day.

A self-led tour, with photocopied materials in hand, can be a rich pedagogical experience, albeit highly dependent on the quality of materials. But no handout, however comprehensive, can fully substitute for the presence of an expert who can clarify and extend understandings on the spot. Using technology to produce a kind of augmented photocopy, with a richer array of background materials and tools to test self-understanding, had the clear potential to be an improvement over present methods, as has been shown in the case studies above. It was clear from the post implementation feedback in this project that students valued this novel approach to supporting fieldwork learning. Students reported most positively on the way that the app in case study one supported what the authors have called 'directed looking'. On a conventional walk with an experienced guide, or with a printed guide sheet, students do not have the benefit of comparing historical material, such as archive photos, on the spot. While presentation of this material would have enhanced understanding of the urban fabric, students were at the same time developing experience of operating cutting edge site based project management tools.

The project enabled the researchers to use technology to explore the value of field based learning as part of the development of students' individual professional competence. While small group learning is well established in the design curriculum, mostly through the auspices of the design studio, most of the peer to peer learning that occurs is in the form of 'legitimate peripheral participation' (Lave and Wenger, 1991), a relatively passive activity. As Mogk and Goodwin (2012) point out, field-based learning, which takes place outside the confines of controlled studio environments, can help initiate beginners into a professional community of practice. Working together on shared professional activities helps students 'learn the ropes' within the safety of a group and bench mark their own developing expertise. Mobile and tablet technologies that enable continuous connectivity and networking between geographically dispersed individuals allow learning to occur across the boundaries of time and space. While a photocopied handout is a mute object, conveyed between a teacher and student, a mobile app has the capacity for encouraging students to share their learning experiences with each other, as they happen, via popular micro-blogging sites, such as Twitter or Facebook.

Innovation of mobile mediums in learning and teaching in fieldwork activities

Technological innovation can be demonstrated in the outcomes if we understand technological innovation of existing systems and processes (including teaching practice) to generally follow a four step implementation process, as outlined by Puentedura (2009). We can see two of the four steps, substitution and augmentation, in case studies 1,2 and 3 where mobile technology augmented and facilitated existing modes of teaching and learning; in case study 4 we can see the team progressed through a task modification stage to task redefinition:

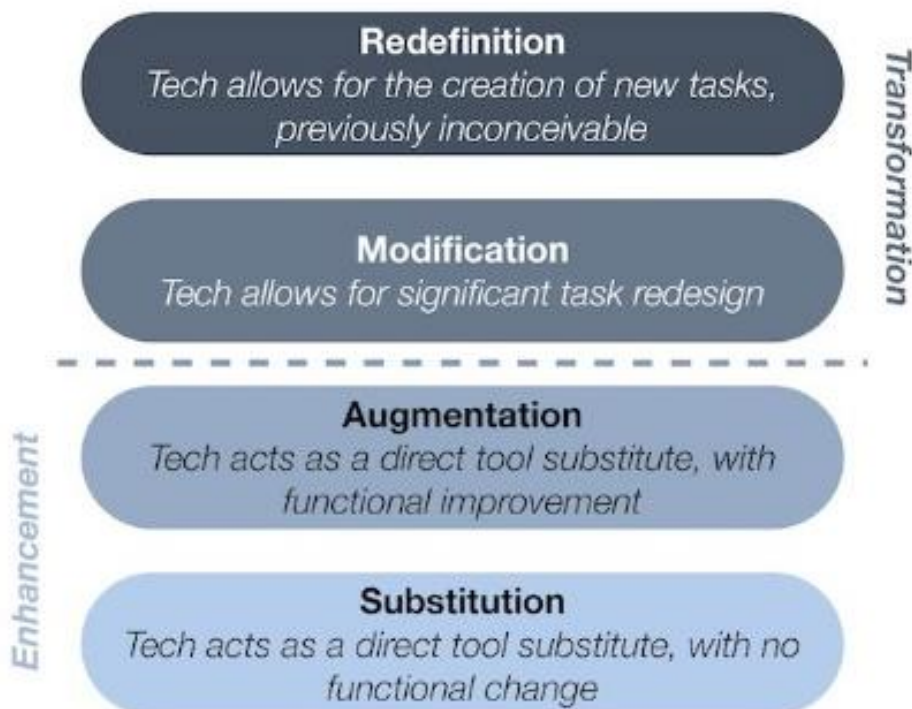


Fig. 1 Puentedura (2009).

In interviews, research team members reported the need to be innovate, and agile in the design and implementation of mobile tools for fieldwork education.

Technology is always developing, and in the case of digital technologies, at a fast rate. Likewise, the process of teaching and learning is always changing, arguably at an equally rapid pace. The notion of 'improvement' necessitates keeping up with the latest advances and continually acquiring and using/testing new technologies whilst building on previous experiences. Thus, the device fieldwork we developed is not an end-point but rather an important and valuable part of the process of change.

We largely achieved what we set out to do, although we did change our expectations a few times. Rather than develop any bespoke software, we used off-the-shelf apps. We also changed the spaces we investigated based on the experience of the first year. Similarly, we altered the exercise content and the apps used based on the first year experience.

An analysis of the documentation supplied to the evaluator substantiated this claim. It was clear, throughout the project, the researchers ensured that the technological innovation was in the service of the curriculum objectives, rather than the other way around. Thus, the solutions generated by the project were both robust and practical with an eye to long-term viability. By keeping the apps relatively simple, or by using fit for purpose 'off the shelf' apps, the project leaders avoided the risk of building 'one off' technological innovations which had limited potential for adaptation and re-use.

Unexpected findings and outcomes

Unexpected findings from the case studies have also informed the iterations of the case studies. To add to this learning, research team members spoke of growing interest in the integration of digital tools to their general teaching:

We perhaps may have opened up a space for thinking about the technological mediation of learning.

The use and testing of the mobile technologies within the teaching environment has been met with considerable success and the outcomes will lead to lasting developments in the quality of teaching within the subjects I teach.

...the key impact on me has been the gradual acceptance of the digital technology in teaching, and specifically, as a key tool in fieldwork. The ability to present students with a far broader array of historic data than previously possible, and to design methods for interpreting that data whilst immersed in the field, has made a significant impact on the delivery of my [] teaching.

In many senses the project chartered new territory, and the serendipitous outcomes included highly nuanced findings related to the use and application of idevice technology in the field. This is an area that represents a developing body of knowledge and experience and although in some senses it was idiosyncratic by nature, the sharing of this knowledge among participants proved highly valuable in advancing the notion of mobile technologies becoming more intrinsic to teaching and learning.

Discussions with invited reviewers substantiated these statements. All the reviewers who were interviewed remarked on the unexpectedly rich findings in this research, particularly around a better understanding of some of the practical and logistical problems with using and designing this kind of technology – which are outlined in detail in the final report. The team member with primary responsibility for case number four reported paying close attention to these difficulties and his innovative solution resulted in the interesting teaching and learning innovations in leading students into app design.

Extending the possibilities of this research

The development of the mobile supported fieldwork exercises has immediate short-term benefits within the current structure of teaching and learning within each of the faculties in the partner institutions. It has great potential to influence teaching and learning in other places; making the applications available through the iTunes store increases the possibility that impact can spread beyond the partner institutions themselves.

It is important that this kind of technological development takes place within our higher education institutions. There is no doubt that the ‘massification’ of higher education over the last couple of decades has contributed significantly to the workload of academics. Guided walks, which have been a key part of design pedagogy for the last 50 years, have become increasingly unfeasible as the groups of first year students get larger as noted earlier. The trend to online education is one way that institutions have responded to the phenomenon of massification, but this project extends the possibilities in intriguing directions.

If online education can increasingly move ‘outdoors’ through use of tablet technology such as this, the possibilities for a richer, more engaged online education paradigm start to emerge.

Guidelines and website developed by the project

Proposed guidelines and website:

To provide forward-looking cross-disciplinary guidance for Australian universities in the methods of designing and delivering mobile learning for fieldwork. Generalising findings from the Built Environment is possible through the cognate relationship of its various sub-disciplines to science, engineering, the humanities and the arts. A dedicated website will

provide information about the methods and findings of our four studies and will present our generic guidelines for designing mobile activities.

Guidelines

The guidelines developed for the project are hosted on

<http://mobilefieldworklearning.wordpress.com/guideliness-for-mobile-supported-fieldwork/>

The Potential Uses of Mobile Devices

- *Task instructions and navigation.*
- *Rich content delivery.*
- *Data capture*
- *Field recording.*
- *Collaboration between students and/or teachers.*
- *Designing content for mobile platforms.*

Development paths: acquiring and creating tools and learning materials

- *Student access to tools.*
- *Practical challenges of digital technology in the wild.*
- *Custom-building apps.*
- *Use of existing apps.*
- *Minimal, iterative development paths.*
- *Proliferation of tools.*

Designing Field Activities

- *Directedness of field activities.*
- *Strength of links to assessment.*
- *Inclusion of engaging supplementary activities.*
- *Influences of social interaction.*

Designing Learning Materials for use *in situ*

- *Legibility of materials.*
- *Lean servings of content.*
- *Support for directed looking.*
- *Genres of delivery.*
- *Instructions and templates.*

Exercise framing: briefing and debriefing

- *Framing the role of mobile technology.*

This is a comprehensive tool to describe the issues around the development of mobile learning and fieldwork activities. It gives examples from the case studies each of the main topics above. As such, it is a useful guide to the development of fieldwork activities for mobile learning, it uses clear language to describe the issues that the projects faced in the development of the fieldwork activities and the ways that they responded to these issues.

Website

The website hosts the project under the headings of:

- Home
- Case Studies
- Publications and events
- Other links

The project related website used the popular blogging software Wordpress to organise information and demonstrate the functions of the mobile fieldwork applications. The provision of this kind of information is a valuable addition to the applications themselves, especially for other teaching professionals. This information allows information about the apps to be put in the context of use and give those who might be interested in using these apps a context for exploring how they might be implemented in their own teaching and learning activities.

The website is clearly laid out, the interface is simple and clean. There are a few minor issues with spelling, grammar and repeating words. A copy editor may be helpful to find these issues quickly.

Although the website presents information from the final report in an easily 'digestible' format, it is rather static. The site has not been constructed in such a way as to allow readers to comment or give feedback on the written material. This presents a missed opportunity to garner feedback and develop ongoing conversations with the potential audience for the research, and extend the impact of the research. If the audience for the website material had been more carefully selected and cultivated it may have produced a source of information and feedback for the designers as they progressed the work, and ongoing engagement for sustainability of the project.

Engagement with Australian educators

Proposed engagement with Australian educators:

To engage with Australian educators to collaboratively reflect on and improve the use of effective field learning and teaching techniques and tools. This will occur initially through our Reference Group and non-participants observers. A national workshop will be held towards the end of the project to share and stimulate further development.

Actual engagement with Australian educators

The project has produced the following engagement outputs.

Conference Proceedings

The following three presentations were made at conferences:

- Constantinidis, D., Smith, W., Chang, S., Lewi, H., Saniga, A. & Sadar, J. (2013) 'Designing Fieldwork with Mobile Devices for Students of the Urban Environment', in Proceedings of the *Annual Conference of the Australasian Society for Computer is Learning in Tertiary Education* (ASCILITE), Sydney.
- Lewi, H. & Smith, W. (2013) 'Designing mobile guides for student field trips'. In Proceedings of the *International Conference on the Future of Education*, Florence.
- Lewi, H., Saniga, A. & Smith, W. (2012) 'Presenting Historic Landscapes: a mobile digital guide to the Botanic Gardens Melbourne' In *Proceedings of the Annual Conference of the Society of Architectural Historians of Australia and New Zealand* (SAHANZ).

Journal Articles

A journal article has been published for architectural researchers and educators, and a second one submitted:

- Lewi, H. & Smith, W. (2011) 'Hand-held histories: using digital archival documents on architectural tours. *Architectural Research Quarterly*, 15(1), 69-77.
- Submitted to *Landscape Review Journal*: Lewi, H., Saniga, A. & Smith, W. 'New Tools for Historic Landscapes: a mobile digital guide to the Royal Botanic Gardens Melbourne'

Seminars about the project findings.

A number of seminars have been held to report and discuss the findings of the project and to consider how they might be applied:

- 2011, November. Hannah Lewi and Wally Smith: Seminar for Faculty Architecture, Building and Planning, The University of Melbourne
- 2012, October. Dora Constantinidis: Seminar for the Centre for the Study of Higher Education., University of Melbourne for staff undertaking Graduate Certificate in Tertiary Teaching.
- 2012, October. Wally Smith and Dora Constantinidis: Interaction Design Lab seminar, University of Melbourne.
- 2013, July. Dora Constantinidis: Seminar for Monash Excellence in Education Research Group
- 2013, October. Hannah Lewi: Invited seminar to School of Built Environment at Curtin University.

National Workshop.

In November 2013 a workshop was held as a forum to present the project cases with similar work by other teachers and researchers, with an audience 30 people from 7 Institutions. The presentations at the workshop were:

- Hannah Lewi (University of Melbourne) 'Formative Histories Walk Melbourne'
- Andrew Saniga (University of Melbourne) '*Landscapes in Time: an iPad guide to the Royal Botanic Gardens*'
- John Rayner and Jenny Bear (Burnley Institute) '*The Burnley Plant Guide App*'
- Sophie Sturup '*Mobile Map-reading in the Field*'
- John Sadar (Monash University) & Dora Constantinidis (University of Melbourne)- '*Environmental Measurement and Intuition*'
- Diane De St Leger (University of Melbourne) '*Podtour: A l'écoute de Melbourne*'
- Lee Stickells and Ann Deslandes (University of Sydney) '*Teaching and Learning for Chance: Mobile applications of urban history*'
- Laurel Dyson (University of Technology, Sydney) '*Mobile-Supported Fieldwork for Information Systems and IT Students: Two Case Studies*'

The project team also used its reference group to focus its direction at the mid point of the project.

Evaluate the effectiveness of the dissemination strategy

This project had a wide and rich range of outcomes:

- A project related website with resources, that documents the four mobile supported field work exercises with case studies, and guidelines for developing fieldwork activities in university disciplines.
- 3 conference presentations
- 2 journal articles
- 5 seminars for teaching and learning groups
- A national workshop on the topic of mobile fieldwork learning

Conference presentations and Journal papers:

Three conference presentations and two journal papers represent the traditional publishing outcomes from this research. Papers were presented at the *Annual Conference of the Society of Architectural Historians of Australia and New Zealand (SAHANZ)*; the *International Conference of the Future of Education*; the *Annual Conference of the Australasian Society for Computer is Learning in Tertiary Education (ASCILITE)*.

All these conferences are good avenues for the distribution of this research and I am sure that the audiences there would have found much of interest in the research. The first of these, SHAHANZ is an interesting choice of conference in this case, with its almost exclusive focus on architectural history. It is notoriously difficult to get a paper, which has any kind of technological focus into these proceedings so the authors should be commended for this in particular. This is one way that the research would have had a broader audience, beyond those academics with a particular interest in applications of technology in academic research. A journal article has been published in *Architectural Research Quarterly* and another is in press in a landscape journal. It is hard to evaluate the impact of these publications until more time has passed as the rate of publication in architecture is slow compared to scientific disciplines and one can expect to wait several years before citations become a reliable source of data on impact.

Teaching and learning seminars

Teaching and learning seminars are a good way to disseminate this kind of research as they encourage the free flow of ideas between colleagues directly engaged with the design and implementation of new approaches to teaching and learning. There was a wider than expected range of audiences for these teaching seminars. The project leaders clearly went to great lengths to ensure that they presented inside and outside of the partner institutions so that a wider range of interested professionals had access to the work. It is notable that one of the seminars targeted academics who were currently undertaking the graduate certificate in tertiary teaching.

The benefits of this project for the field of design education

A self-led tour, with photocopied materials in hand, can be a rich pedagogical experience, albeit highly dependent on the quality of the heuristic tool. But no handout, however comprehensive, can fully substitute for the presence of an expert who can clarify and extend understandings on the spot. Using technology to produce a kind of augmented photocopy, with a richer array of background materials and tools to test self-understanding, had the clear potential to be an improvement over present methods. The replication of existing practice with technological innovations, as pointed out earlier, put helpful limits around the project so that the learning activities still closely aligned to the pedagogical aims of the stated curriculum(s).

The integration of mobile technologies to fieldwork activities is a logical development of existing practice, giving students the opportunity to engage in learning activities that are experiential, in context and simulate professional practice activities. The authenticity of these tasks, when articulated and made explicit, engage students in valuable 'real world' learning.

Further benefits for student professional practice

It is increasingly common for tablet based site inspection tools to be used in project management, and, by the time these students graduate it is likely such tools will be ubiquitous. It is therefore

vital that students learn to handle this kind of technology during their undergraduate education. Even if students do not end up using bespoke applications, exposure to this technology has value for its own sake. Many small practices design their own mobile / tablet based management systems for collecting, storing and analysing data collected on site. The use of this technology in the field models the potentials of these applications and encourages students to explore what use they can find for similar technologies in other areas of their learning and eventual practice. The project supports this exploration by introducing students to a range of custom and off the shelf technology applications that support their design education.

The importance of affect is beginning to be understood as vital to design learning. Learning to affect, and be affected by, 'designed objects' is a key component in the development of 'designerly competence' (Mewburn, 2009). Nottingham (2013) calls this process the development a 'design eye', which is fostered in the design studio environment because it is set up to mimic professional practice. Performing professional actions, such as drawing and annotating representations, in presence of others, including the standard paraphernalia of practice, is one way in which we develop the identity and features of 'professional designer'. Nottingham goes on to argue that emotions have a key part to play in this: learning to feel, and display, the 'appropriate' emotions', at the appropriate times and in relation to the appropriate things is key to understanding the designerly habitus. In other words: designers have to learn what their community considers 'ugly' and display disgust in the appropriate way; likewise they must learn what is considered 'beautiful' and how to display delight in the appropriate fashion. Field-based learning enabled by tablet technology has the capacity to operate as the expert teaching voice in this fieldwork context and is demonstrated by the positive feedback from students, in particular in evaluating the tools in case study 2. Activities that supported group work by defining the roles students should enact for example the second iteration of Case study 3.

Applications to other fields of education

It was a strength of this project that there was more than one design discipline represented in the case studies. By including architecture, landscape design, a wider range of frameworks for action were able to be explored. The design disciplines, while sharing some basic epistemological assumptions and representational modes, are quite different with regards to the knowledge base that they require for effective practice (Lawson, 1983). For example, to be a good landscape designer one must have technical knowledge of plants, soil conditions, environmental factors and so on, in order to be able to envision a finished landscape. An architect must have knowledge of forms, structural capacities and building typologies in order to be able to envision a finished building. These differences enabled a broader exploration of the mobile tools, which we can see between case studies 1, 2 and 3 in particular, with the capacity to produce a range of different outcomes, but narrow enough to be feasible and achievable within the limits of time and budget.

In fact, professional development in a range of disciplines relies on some component of fieldwork. Mogk and Goodwin (2012) in their empirical exploration of fieldwork in the geoscience curriculum argue that field based learning produces “cognitive and metacognitive” gains for students, facilitates learning that can not be achieved in more controlled environments, helps students learn to make professionally appropriate representations and helps initiate beginners into a professional community of practice. It is therefore highly appropriate that a number of design disciplines were involved in the development of tools for this project.

Sustainability of the Project's Focus and Outcomes and some limitations

In a practical sense, the guidelines and case studies are useful tools in developing course based fieldwork activities. It is up to individual and team course leaders and senior leadership in universities to continue to lead and develop this innovation. The sustainability of this particular project is its ‘bottom up’ nature. In case studies 1,2 and 3, individual lecturers integrated appropriately modest and fit for purpose technology into existing fieldwork activities. Slowly over time as more and more students have ‘bring your own devices’, the use of such apps by teachers to support suit learning will be an everyday occurrence, however there is no doubt that the moment adoption is sporadic without this kind of structured project support available. How lecturers take advantage of this going forward is where we see the sustainability of the project. If the website could be updated with more case studies and kept up to date this would greatly enhance its viability and potential engagement. It’s possible for the team to turn this site into a community of practice if they invite in participation by others who are engaged in similar projects so that the website becomes a knowledge resource going forward.

One of the research team responded if there was any limitations in the project and described the necessity of keeping engaged and seeing the potential in the developing technology,

Technology is always developing, and in the case of digital technologies, at a fast rate. Likewise, the process of teaching and learning is always changing, arguably at an equally rapid pace. The notion of ‘improvement’ necessitates keeping up with the latest advances and continually acquiring and using/testing new technologies whilst building on previous experiences. Thus, the device fieldwork we developed is not an end-point but rather an important and valuable part of the process of change.

Thus, the sustainability of the project would be enhanced by keeping up with the developments in digital technology and their real work applications in professional practice. It would be further enhanced by a larger study of the use of mobile fieldwork activities and its benefits and limitations for student learning.

Team Leadership

The research team utilised a model of distributed leadership, each of the academic/ subject leaders led and developed their case study while remaining in close communication with the others so learnings could be shared and developed. This was an agile and responsive mode of operation, which enabled fieldwork activities to be developed, implemented, and improved over time. The team is to be commended for the substantial outputs from this project, which demonstrates in the most concrete way the effective leadership and collaboration skills of the whole team.

Conclusions and Recommendations

The project met its overall aims to develop and evaluate innovative approaches to learning and teaching in the field. It has achieved its outcomes and delivered innovative responses; developing, implementing and evaluating fieldwork activities using mobile technology and devices. The resources that document the project are user compatible, and they address the issues faced by the project. The importance of the learning for the project team from this project cannot be undervalued; the further engagement in learning and teaching using digital tools by the research team is commended.

Recommendations for new OLT support materials

More guidelines should be written to assist project leaders in disseminating the findings of their research in non-traditional formats, like blogs. It was pointed out above that there was a missed opportunity in this project for the supporting website to become more interactive space where the audience had the chance to give feedback and ask questions of the project team. Social media channels are a rapidly developing space and many academics do not have the skills and expertise to make best use of this space for research purposes. Such material already exists in multiple places on the internet and it would be a relatively simple proposition to collate them in a user friendly format.

Recommendations for future OLT funding

The use of mobile tablet devices in teaching and learning is an exciting opportunity for research in the future and it is highly recommended that the OLT fund more projects of this kind. As the authors made clear in their final report, the amount of work required to take this sort of technology from interesting potential to actual application is significant. Development of this kind cannot be done without the support of the OLT.

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Appendix 1: Proposed Project Timeline

Detailed Timeline

Plan of Studies		Dissemination plan		Reporting	
		information	engagement		
Stage 1	Aug 2011				
	Sept				
	Oct				
	Nov				
	Dec				
	Jan 2012				
	Feb				
	Mar				Interim Stage 1 Report
	Apr				
	May				
	Jun				Stage 1 Report
	Jul				
	Aug				
	Sept				
Stage 2	Oct				
	Nov				
	Dec				
	Jan 2013				
	Feb				Interim Stage 2 Report
	Mar				
	Apr				
	May				
	Jun				
	Jul				Stage 2 Report
	Aug				
	Sept				
	Oct				
	Nov				
	Dec				
	Jan 2013				
	Feb				
	Mar				
	Apr				
	May				
	Jun				
	Jul				

Appendix 2: Evaluation Questions, Data Collection & Analysis

Evaluation questions	Data collection and analysis
To what degree has the New tools and techniques for learning in the field: studying the built environment project been implemented as planned and funded	Compare program plan with operational documents and identify implementation issues. Collect stakeholders views on their validity and importance. Documented in section: Meeting the project aims and deliverables
To what extent are participants satisfied with the design and delivery of the New tools and techniques for learning in the field: studying the built environment project	Confirm extent of satisfaction of stakeholders through survey/interviews. Documented in section: Meeting the project aims and deliverables Team leadership
To what extent have the New tools and techniques for learning in the field: studying the built environment project stated outcomes been achieved?	Collect evidence for each of the project outcomes. Documented in section: Meeting the project aims and deliverables
What, if any, unintended outcomes have been identified?	Identify unintended outcomes and assess their impact on the current cohort and the future of the program. Documented in section: Meeting the project aims and deliverables
How might future New tools and techniques for learning in the field: studying the built environment project be improved?	Identify issues and suggested improvements from documents and interviews with participants and project team members. Documented in section: Conclusions and recommendations
To what degree has the guidelines for New tools and techniques for learning in the field: studying the built environment project been developed?	Collect information to assess degree of development of New tools and techniques for learning in the field: studying the built environment project through interviews Documented in sections: Meeting the project aims and deliverables Sustainability of the project's focus and outcomes
What are the limitations of the New tools and techniques for learning in the field: studying the built environment project?	Identify unintended outcomes/ issues of New tools and techniques for learning in the field: studying the built environment project and suggested improvements from interviews with participants and project team members Documented in sections:

	Meeting the project aims and deliverables Conclusions and recommendations
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Appendix 3: Confidential Interview Questions for Stakeholders

Q1 To what degree has the (project) been implemented as planned and funded?

Q2 To what extent do you feel the participants are satisfied with the design and delivery of the (project)?

Q3 To what extent have the (project) stated outcomes and deliverables been achieved?

List the outcomes and deliverables: achieved/not achieved/comments

Q4 What, if any, unintended outcomes have been identified?

Q5 How might future the (project) be improved?

Q6 To what degree has the model for the (project) been developed?

Q7 What are the limitations of the (project)?

Are there any issues you think are important and should be aired?

Q8 What main impact(s) has the project had upon you personally/professionally?

Are there any claims about this Project that you would like to make?