LUXURY IS…. SPACE TO WRITE:
USING TABLET PC TECHNOLOGY TO ENHANCE LEARNING?

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Abstract

This project reports on the use of tablet PC technology in the classroom to enhance student learning. It is based on a literature review, action research and reflective practice through the use of peer review. Research suggests that a critical feature of understanding student interaction with in-class materials is whether lecturers/students construct the lecture experience as being based on transmission and receipt of messages or a complex activity that enhances learning through relatively more active and inter-active processes. The empirical study involved two lecturers working with different undergraduate cohorts in lecture contexts within the built environment (quantity surveying and planning). The paper locates the discussion in relation to the use of PowerPoint, presents the two case studies, describes the use of tablet pc technology to increase student engagement, comments on the benefits of peer review in providing constructive feedback, and reflects on the conference theme in terms of the luxury of having pedagogical research space.

Introduction

This paper discusses a collaborative action research educational project concerned with examining the use of tablet PC technology for teaching in lecture contexts. There is emerging evidence in the generic educational literature that tablet PCs might variously promote a relatively more student-centred and interactive approach to learning (Weitz *et a*l., 2006). Using two different applications, this small study specifically sought to examine the potential benefits of this technology for students in two built environment professions, quantity surveying and planning.

The idea for this modest project first stemmed from the authors' experience of using traditional technologies, such as overhead projectors (OHPs), whiteboards, and flip-charts for collating data and sharing student input

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in real time in lectures and studio settings. It was informed by a concern that these tools are often cumbersome to use, generally require pre-booking and even then may be unavailable in the classroom. Moreover, it is increasingly difficult to procure and maintain OHPs, for example, as this form of equipment is becoming obsolete. In addition, there are a number of practical weaknesses with such teaching apparatus. Acetates and flip-chart paper tend to be relatively ephemeral and costly. Post-it notes are relatively fragile and their use for clustering relationships or grouping ideas, for example, are not easily transported from one session to another. As a result, student ideas and contributions may be perceived as transient, 'one-off' and not easily shared and reviewed by all participants beyond the classroom experience.

Second, the benefits of PowerPoint slides for effective student learning is highly contested. Whilst it is generally agreed that PowerPoint has had an important impact on teaching, with advocates of this presentational tool arguing that it offers scope for advanced preparation, organisational structure, incorporation of figures and complex data, and instantaneous visual display, for example, critics of the software point to the over-scripting and lack of adaptability of PowerPoint (Anderson, 2004). In parallel, a preoocupation within institutions of higher education to make lecture handouts available to students via university intranets risks encouraging a reliance on PowerPoint handouts. This reliance on digital media and internet access may be understood as part of the wider phenomenon of the ways in which computers are changing the way we think (Turkle, 2003). Indeed, in a general commentary, Turkle (2003) highlights the tensions that exist when PowerPoint, essentially a corporate boardroom tool, is transferred to the classroom context and student use. She summarises this as the feticisation of outline over content.

In contrast to the relative inflexibility of PowerPoint, tablet PC technology appears to offer a portable tool with the potential to save, archive, reuse and distribute materials, therefore providing relatively more inclusive opportunities for feedback and critical reflection over space and time. In addition, the interactive potential of the technology suggested that it might offer new ways of actively engaging students in a spontaneous and mutually responsive construction of learning objects. The aim of the project was therefore to integrate tablet PC technology into the teaching of a first year quantity surveying module and a third year research methods planning module and to examine its use in practice and its impact on student learning.

The project adopted an action research approach and incorporated the institution's peer review process. In this way, the project is illustrative of a pragmatic approach to using peer observation in a developmental way to support critical reflection in the classroom. The initiative involved two colleagues from different professional backgrounds in quantity surveying and planning working together with technical support provided by the Project Coordinator of the University's ICT Services Department.

This conference paper purposefully uses the conference theme *Space is Luxury* in two ways: first, it examines the use of the technology to create openings (spaces) for students to engage in the creation of learning objects; second, and promoted by the 2010 AESOP focus, it reflects on the space (time) to critically

reflect on one's teaching practice and to engage in pedagogical research. The paper is structured as follows. The first section provides a literature review of the use of communication and presentational technology in educational contexts which provides the background to the discussion. This focuses on the use of tablet PCs and PowerPoint. This section is followed by an account of the conceptual framework for action research used in the project and the use of peer review of teaching in the two case studies. Following a discussion of the use of tablet PC for teaching construction measurement to undergraduate students, and the use of the same technology for teaching research methods to planning students, the paper then makes some general remarks about the practicalities and benefits of teaching with tablet PCs which are intended to be of wider relevance. The paper concludes with some reflections on practical ways to engage in research-informed scholarship and to create the ′space to write'.

Literature Review: The Tablet as Communication Tool

In Antiquity and during the Middle Ages, reusable and portable coloured waxed tablets were used as note-books and for various writing and drawing purposes. In practice, small wooden frames were filled with beeswax – tablets – which could be written on with a stylus. The stylus had a sharp side and a flat side so that with one side incisions could be made in the wax, whilst the flat side could smooth over the marks, providing the answer to an early fourth or fifth century riddle: "The one part revokes what the other has done" (Scheller, 1995: 3). A number of wax tablets could also be linked together to create "books". Frequently transient in purpose, archaeological digs have uncovered a number of tablets which provide useful insights into the nature of communications over the centuries. Indeed, these precursors to tablet PC technology represent an important legacy as to the exchange and recording of pictoral and written materials.

As a visual communication device, tablets serve to raise important questions with respect to how humans communicate, the relationships between reading and writing, how the oral is converted to the written form, how each mode of communication informs the other, whether artifacts are considered worth preserving, and how ideas are stored for posterity (Small, 1997). In terms of the use of tablet technology in the ancient classroom, Small (1997: 146) quoted Lucian writing in the second century AD who commented: "I had played with wax [as a child]; for whenever my teachers dismissed me I would scrape the wax from my tablets and model cattle or horses or even men....I used to get thrashings from my teachers on account of them". Not only does this indicate the tablet's ephemeral nature and re-usability, it also points to the evolving use of teaching technologies and students' relationships with such tools and use of their content.

Centuries later, and from an instructional presentational perspective, May's (1855) account of encountering a new teaching device during the winter of 1813/14, is equally worthy of mention, when he observed: "on entering the room, we were struck at the appearance of an ample Black Board suspended on the wall, with lumps of chalk on a ledge below, and cloths hanging at either side..... the process of analytical and inductive

teaching" (cited in Anderson, 2004: 31). Such stories of the evolving educational environment are salutory and serve to highlight how inventive technologies eventually become commonplace.

In the contemporary classroom, tablet PCs are effectively a notebook computer with a liquid crystal display screen, upon which the user can write, using a special pen or stylus. Annotations or handwriting are digitised, enabling text to be converted using handwriting recognition, or remain as drawing objects. The particular model used in this project was a Toshiba Portégé comprising both a keyboard and swivel screen, meaning that the screen can be laid flat. This portable *board* then provides a convenient writing surface for manipulating teaching materials in a dynamic and responsive way whilst projecting them onto a screen using a data-projector. Tablet laptops facilitate a number of uses, such as annotation of PowerPoint slides with the use of a stylus pen. Different thicknesses and colours can be used and writing, shading and editing drawings or comments may each add a different layer to the development of an argument or explanation. In effect, the stylus and tablet act in similar ways to an interactive whiteboard, enabling real-time annotations to be incorporated into classroom teaching. This real time interaction with students in sharing oral, written or drawn ideas then provides an opportunity to exchange information for the duration of the classroom episode or to save the markings for dissemination via institutional course intranets. Taken together, this repertoire of options suggested the potential of the technology in providing clarity, supporting explanation and adjusting materials during the live lecture or workshop environment.

A review of the relatively scarce published scholarly literature shows that there are limited insights on the use of tablet PCs in the built environment, although there are examples in relation to the use of this technology in the context of engineering (Frolic and Zurn, 2004; Theys *et al*., 2005; Huettel, 2006) and in computer science (Anderson, 2004). The lack of attention in the built environment is surprising, given the use of on-site data collection, and reliance on drawings and plans in a number of the professions. Moreover, in terms of teaching, researchers such as Ooms *et al.* (2008) have identified that mobile technologies, including tablet PCs, enhance teaching, learning, assessment and feedback. Yet, any blanket use of a particular communication tool must be questioned; it is critical to be clear about the pedagogical rationale for the use of any technology in the support of student learning.

Background to the Project: Communication Technologies

It is generally accepted that lectures form a core learning space for students, even though their effectiveness in supporting student learning is highly questionnable (Laurillard, 1993; Race, 1999). Research undertaken as part of an earlier (2008) study (Peel *et al*., 2010) used an open-ended questionnaire survey to identify contemporary student perceptions about what makes for an effective lecture. Students noted that the principal value of lectures stems from what they "learn about a topic". Nevertheless, many said that they did not "feel involved", wanted "more interaction with the lecturer and other students" and liked "question and answer sessions". Several mentioned that they disliked "being singled out by a lecturer" or "put on the spot". Several

students commented on the need for lecturers to be "dynamic", do "more than read the information on the PowerPoint slides", and to have "more visual" stimulants. The students' observations from this small, though informative, survey confirmed Gallagher and Reder's (2004/5) concerns that lecturers and presenters *assume* that PowerPoint is visually attractive, engages students and enhances understanding, whilst in practice, the preparation of a structured and detailed outline of a lecture which is then simply spoken by the lecturer is, they contend, an abdication of the teacher's responsiblity to engage and interact with students in acts of learning.

Notwithstanding the ubiquitous use of the commercial application PowerPoint as a presentational tool in classroom, business and conference settings, there is certainly no consensus about the benefits of this visual aid. Indeed, Cyphert (2004: 80), for example, notes how PowerPoint is "denounced by CEOs and academics as intellectual reductionism". Gallagher and Reder (2004/5) provide a succinct summary of the literature on the benefits and weaknesses of PowerPoint, providing three groupings of the available literature which: (i) provides tips and tricks on giving *better* presentations or creating *better* slides and (ii) offers practical ways for using PowerPoint in teaching. A flavour of some of this literature is captured in a provocative article in *Fortune* magazine entitled – 'Killing me Microsoftly: Almost nobody speaks in public anymore without using PowerPoint. But some liken the program to a cognitive Veg-O-Matic that slices and dices human thought' (Keller, 2003). Pointing to the ways in which the software functions, Keller (2003) contended that the preconceived format and mode of organising material not only condenses ideas on the slide but also constrains critical thinking about those ideas. The merits of the software is also severely challenged by Tufte (2003) who coins what he terms the PowerPoint cognitive style which reduces and impairs thinking by trivialising content and conflating sentence construction with bullet points. Indeed, some commentators emphasise that students are sceptical that their learning is enhanced by the use of PowerPoint and feel ignored in classrooms when lecturers appear to focus on their PowerPoint presentations (Voss, 2004).

Significantly, Gallagher and Reder (2004/5) highlight a third body of critical pedagogical literature which questions the use of PowerPoint in teaching. A comprehensive article by Levasseur and Sawyer (2006) seeks to provide a balanced account of the evidence, suggesting that whilst PowerPoint can offer an engaging sensory experience, over-use of the technology can dampen learning. At one level, the success of the technology may turn on avoiding what has been called "PowerPointlessness". This term (coined by Jamie McKenzie) refers to the misuse of the associated PowerPoint gadgetary which risks emphasising visual seduction over sophistication of content, resulting in slides which serve as an intellectual "crutch" rather than a visual aid (McDonald, 2004). Here, critics highlight the software's rigid structure, tendency to result in being podium-fixated and presenting in the dark, and general lack of flexibility and creativity in real time teaching contexts. Indeed, Anderson (2004: 32) notes the comment made by one lecturer that "PowerPoint sucks the life out of a class". In similar vein, Cyphert (2004) summarises that, notwithstanding the promise and allure of colour, design and animation, the results are monotony, tedium and lack of engagement. The

risk of preparing a comprehensive set of PowerPoint slides is that one makes assumptions about what the students already know and what they will understand during the lecture. Such an approach potentially focuses on the materials at the expense of student or audience engagement and understanding.

Whilst clearly not advocating that all lectures and presentations involve on-going audience participation, this body of evidence supported the case for exploring whether tablet PCs might enhance and expand the potential for the use of visual media, such as PowerPoint. The prerequisite was that there needed to be a pedagogical justification for this type of interaction in the modules selected for testing the technology.

Context for the Two Case Studies: Action Research and Peer Review of Teaching

The action research approach adopted for this study follows an established methodology which is based on critical reflective professional practice. The C.R.A.S.P. model (Zuber-Skerritt, 1996) comprises five iterative and mutually reinforcing elements. These are: (1) a **C**ritical attitude to one's teaching practice; (2) a commitment to **R**esearch into teaching (through action research); (3) a desire to retain personal **A**ccountability through self-directed reflection and study; (4) **S**elf-evaluation (including control of input into appraisals, and publication); and (5) **P**rofessionalism, demonstrated by systematic involvement in educational research, theory, practice, and dissemination. In practice, even small projects require resourcing.

The purchase cost of a Toshiba Portégé is approximately £1200 (2009 prices). In bidding for funding, it was evident that there were advantages to be gained from a joint study that specifically used the institutional peer review of teaching process as an integral component of the data collection and evaluation. During the University of Ulster's Centre for Higher Education Practice 2009 funding round, an application was made for £5600 to acquire four tablet PCs to enable groups of students to use the equipment and to include conference attendance to disseminate the research. In the event, the project was only awarded £1500 which scaled down the ambitions of the project. The peer review process at the University of Ulster is intentionally developmental and allows lecturers to select a partner, to identify an aspect of their teaching practice to examine and review during an academic year, and to record the process on-line. Embedding this procedure into the methodological approach built on a collaborative learning reflective model (Peel and Shortland, 2004) which encourages reflective dialogue. In practice, it meant that both lecturers were able to use the peer observation element of peer review to study the use of tablet PC technology in two very different contexts. Both lecturers were given active encouragement by the institution's project technology support team, since the initial impetus for testing this technology was based on earlier feedback from informal peer observation on the researchers' use of acetates and PowerPoint for teaching purposes.

The first case study *Student Participation, Interaction and Reflection via Interactive Tablet* (SPIRIT) involved a lecturer using a tablet PC to help quantity surveying undergraduates to understand the relatively complex diagrams used in construction measurement. Here, the lecturer had previously experimented with

improving student engagement in the subject of measurements through teamwork and presentations using acetates and OHPs. This was relatively cumbersome and time-consuming since acetates had to be prepared and then scanned for subsequent uploading onto the intranet. The SPIRIT project offered the potential to consider the use of tablet PC technology to assist student understanding of standard construction two dimensional drawings and the art of measurement, and to facilitate the handling and dissemination of annotated materials. In practice, the delivery of the materials involved using prepared PowerPoint slides incorporating text and plans and the use of dimension paper.

The second case study examined the use of tablet PC technology to enhance student interaction and note-taking (*Nota Bene*). This project grew out of the lecturer's on-going attempts to enhance the use of student handouts and personalised note-taking in class. This teaching strategy had previously relied on a relatively time-consuming process of animating slides to complete partially filled slides on a step by step basis in reponse to individual mouse clicks. The *Nota Bene* project offered the potential of in-class annotation in primarily text-based contexts through real time student input. PowerPoint slides were partially prepared with spaces to enable students to complete the gaps; spider diagrams were used to encourage students to use thought shower or word storm techniques to complete the slides and develop the content, and Word documents were displayed using the tablet PC and annotated during the class. In both cases materials were subsequently uploaded onto the University intranet. In the case of *Nota Bene* this also involved an accompanying podcast element. The next section provides some practical insights and examples from the two case studies, using peer review and lecturer reflections.

Case Study 1 SPIRIT

Measurement of building works is a core subject in the BSc (Hons) Quantity Surveying course at the University of Ulster. The programme attracts approximately 100 full-time students every year, mostly after completion of advanced level examinations from secondary school. Most of these students have very limited understanding of how the construction industry operates, or how buildings are constructed on site. Thus, the subject of 'measurements' is relatively challenging for Level 4 (Year 1) students.

The process of describing and quantifying building items is commonly referred to as 'measurements' within the construction industry. In order to describe and quantify building items students need to have some understanding of the following: construction drawings, visualisation of buildings to be measured, and abstracting the dimensions of an item from 2-dimensional drawing(s). For example, this might include identifying the width and depth of a concrete foundation from cross-sectional drawings, and calculating foundation lengths from plans. This requires that students are able to visualise a 3-dimensional object from 2-dimensional drawings.

In construction management the skill of measurement requires practitioners, such as quantity surveyors, to present measurements appropriately using specially ruled paper; to understand the nature of construction items and their specifications; to calculate building item dimensions, such as the centre-line girth; to write descriptions and quantify items; and to understand the use this information to cost or 'estimate' individual construction items. In short, undergraduate students need to appreciate the importance of accuracy and clarity in presenting and interpreting measurements to avoid potentially costly mistakes in contractual and financial ways. Moreover, it is very clear that students need verbal, numerical and graphical understanding both to interpret and annotate drawings and associated schedules. The teaching and learning strategy for this class involved a one-hour lecture and two-hour studio each week with accompanying directed reading. Handouts, including a copy of the lecture PowerPoint slides, were made available for each lecture prior to the class. Students were encouraged to bring these materials to the relevant face-to-face session. During the class, the lecturer used different pen nibs and colours to highlight different aspects of the drawings and to solicit student answers to guide the annotation (Figure 1). The lecturer was able to model the measurement process in a dynamic way which was then copied by students during the class. The full annotated presentation was then uploaded. There was no evidence that the availablity of the completed slides affected student attendance adversely.

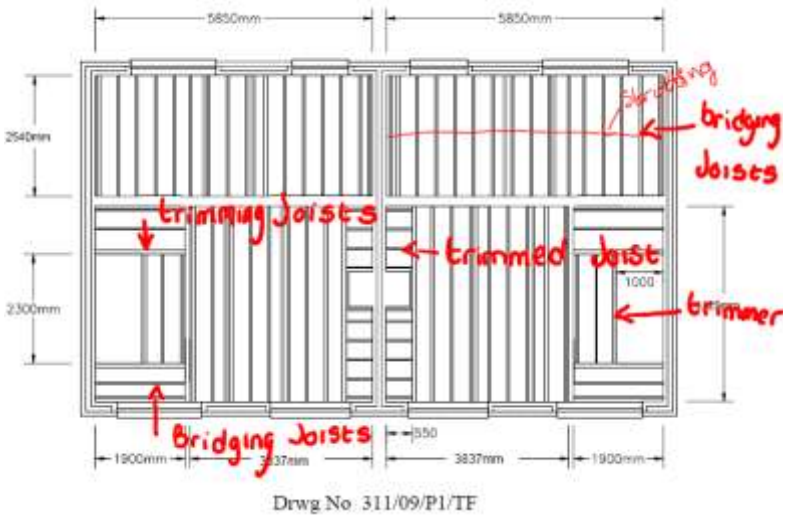

Figure 1 In-Class Tablet PC Annotations of Plan Drawing

A short student feedback survey was conducted after the class where the tablet PC technology was used. Students were also asked to provide copies of the notes that they had made during the session. This complemented the reflections from the peer review. The student feedback was overwhelmingly supportive of the lecturer's use of the tablet PC. Students commented positively on: the use of different coloured pens, the

visual clarity and appeal of the slides, and the intelligibility of the annotations of the diagrams through the highlighting of individual components. From a peer reviewer perspective, the lecturer-student interactions were dynamic with student input forthcoming in order to annotate the slides during a plenary lecture. The act of the lecturer highlighting and annotating various aspects of the drawings prompted the majority of the students to annotate their own handouts. The level of concentration appeared to be high and maintained during the course of the lecture and review of the student notes showed that the students had accurately annotated their own handouts using numerical, verbal and graphical methods. Whilst there were some concerns around legibility of some of the annotations, overall the innovation seemed to improve verbal interaction and active in-class note-taking. Finally, saving the work completed during the class and uploading it onto WebCT meant that the interaction and input into the class became a shared act of learning and co-production of a learning resource.

Case Study 2 Nota Bene

In terms of using a time-tabled lecture series to teach research methods, there appeared to be a strong case for an enhanced use of the PowerPoint presentational tool and other text-based objects with tablet PC technology in order to encourage greater student engagement and input into the lectures. In addition, by integrating the use of the technology as an example of a small research project, this further legitimated and modelled aspects of the research process. The relatively more qualitative use of the technology complemented the measurement application of the SPIRIT project.

A short literature review of student note-taking habits informed the *Nota Bene* project. This reaffirmed that if lectures are to be less didactic in delivery, then the nature of the communication style needs to be clear whether students are required to be engaged in note-*taking* or note-*making* (Badger *et al*., 2001). Here, an important distinction must be drawn between writing down what the lecturer says (transmission) and contributing to the development of understanding (transformation). In terms of technical advice with respect to how students (should) use notes , there are a number of study guides available. These include Cottrell's (2003) nuclear, linear, and pattern notes and Buzan's (1995) radiant thinking (mind-mapping) techniques, for example. It is to be expected that students construct the purpose and value of notes in very different ways.

Critical debates around the use of PowerPoint slides and the lecturer's concern that the existence of PowerPoint handouts potentially results in some students adopting a reductionist approach to acquiring course content rather than engaging in a participative co-construction of knowledge and understanding led to the use of tablet PC to devise learning objects that could be created jointly in class. This included two different applications. First, it involved seeking student input around specific prompts, such as the nature of research (Figure 2) and, second, it deployed a marking up of documents to highlight the structure of a scholarly research paper (Figure 3). The results are illustrative then of a lecturer at work and a teaching and learning dynamic rather than the production of a perfect slide.

Figure 2 In-Class Annotation of a PowerPoint slide

Figure 3 In-Class Annotation of a Research Article

Peer observation of the use of the tablet PC was favourable in that the tool appeared to add an interactive dynamic to the class. The feedback from students as to the benefits from the tablet PC was inconclusive, however, as attendance at the class was sporadic. The lectures were time-tabled over eleven consecutive weeks for one hour (11-12) on a Thursday and it was the only time-tabled class for the cohort for that day; many students have part-time jobs which compete for space. The classes were complemented by small group supervision time-tabled in liaison with the relevant lecturer. This arrangement appeared to reduce the incentive to attend the lecture class. The lack of attendance militated against over-emphasising the action research project. No time during the student lectures was therefore used to discuss the impact of the tablet PC on student learning.

From the perspective of using the technology, preparing PowerPoint slides with an eye to annotating them during a lecture requires thought as to the prospective use to be made of engaging students and the intended learning outcomes. This design stage demands confidence that the resulting material will be complete and accurate and *better* than 'ready-made' slides. Figures 3 and 4 are illustrative of the 'rough and ready' quality of the live lecture. Given the timing and relatively short contact time involved, the particular module selected for investigating the use of tablet PC technology might have been ill-chosen. For example, the technology does require some additional set-up time, and a 50 minute lecture curtails this. In practical terms, and in contrast to a white board or flip chart which are at shoulder height for writing, there is a risk that students end up watching the lecturer's head as they bend over to write on the screen. The level of the podium or desk can therefore severely minimise eye-contact. Moreover, writing legibly requires practice. It is worth noting that the technology was used in another module involving students in small (six persons) workshops. Here, the technology was able to be more carefully integrated as the discussion involved a round table, seated

discussion, and specifically highlighted the collation of student inputs as part of a stakeholder engagement exercise.

Practicalities and Benefits of Using a Tablet PC in Lectures

There are a number of practical dimensions that potential users of this technology would need to consider before implementing this approach which arise from the findings of the two projects discussed. Whilst some of the points would apply to the use of any visual aid, consideration needs to be given to:

- familiarising one's self with the tools (eg colours, tips, eraser);
- practising with the technology in the classroom to be used;
- practising saving files for potential dissemination via an intranet;
- allowing enough time to connect/disconnect the laptop to the projecting equipment;
- being alert to the novelty factor;
- retaining eye-contact with the students when writing on the tablet; and
- making clear annotations.

In contrast to the annotation of acetates on an overhead projector, however, tablet PC technology appears to offer:

- enhanced clarity of image (diagrams can be enlarged without much detriment to quality);
- ease of annotation (different coloured pen tips are available to differentiate objects at a single click);
- a sympathetic screen to write on (rather than looking directly into an OHP light);
- editability (through an eraser tool);
- transferability (by saving annotations and uploading onto WebCT); and
- sustainability (easy re-use and not having to use several acetates or flip-chart paper).

With respect to the use of PowerPoint slides and Word documents, the ability to annotate slides during a class by underlining, circling or stressing relationships, suggests that tablet PCs certainly offer a dynamic and responsive attribute to what might otherwise be static and inflexible slides. By offering the space and opportunity to complete the learning object in real time, tablet PCs do offer an additional teaching resource, and combine the advantages of traditional 'chalk and talk' with portable, digital and reusable learning objects.

Conclusions

The tentative findings from the overall project, and the case studies discussed, are that the visual and dynamic facilities afforded by tablet PC technology provide an additional teaching aid for use in lectures. In *Nota Bene*, the example discussed used PowerPoint slides and Word documents which were then annotated in real time, saved and disseminated to the class using the institution's intranet. The act of physically modelling annotation in the class appeared to encourage students to add their own notes and emphases to their physical handouts. The student feedback from the SPIRIT project was positive, suggesting that the students felt able to engage in working with the lecturer and considered that it helped them to understand the concepts being introduced during the lecture. Both initiatives were based on a pedagogical approach that sought to encourage student engagement with in-class materials so that the lecturers could be sure that the basic concepts had been understood. Visualising and representing this shared understanding on the screen helped to close a diagnostic feedback loop. In addition, with the research methods module, an emphasis was placed on, for example, asserting that learning and understanding is a complex activity that involves inter-active processes of negotiating meaning, and looking for patterns in data collection.

There remain a number of methodological challenges in evaluating teaching projects such as this as ultimately the 'proof of the technology' will be in the demonstration of student learning. Without a control group and without being able to isolate the impact of such relatively small initiatives it is hard to state with any certainty that this technology made a significant contribution to the cohorts as a whole. What using an arsenal of tools does do, however, is to add another dimension to an overall teaching strategy that seeks to accommodate a range of learning styles. By using partially prepared PowerPoint slides that leave space to write in student responses and contributions there is clearly the potential to generate student-lecturer interaction, student interaction with the learning content, and a shared learning experience.

Looking to the ways in which student input within digital learning environments is developing puts this small project into perspective. In discussing the University of Washington's lecturing system, for example, Wilkerson *et al.* (2005) explain how the use of a Ubiquitous Presenter system enables both the instructor and students to interact and annotate slides using a range of internet-enabled computer devices, notably tablets. The Classroom Presenter approach provides a specific space adjacent to a prepared slide to serve as a dedicated annotation area. The luxury of such a space for integrating students' comments, adding additional 'heat of the moment' insights, expanding on the topic and incorportating students' annotated slides which are sent from their own tablet PCs from the back of the lecture theatre in real time illustrate the dynamics ways in which the digital learning and teaching environment is waxing rather than waning.

Epilogue: Luxury is…. Space to Write

This final section speaks directly to the conference theme and reflects on the experience of the case studies discussed for planning education. A recent article in the *Times Higher Education* observed that ”space touches on just about all the tension points within universities” (Reisz, 2010: 13). Whilst specifically relating to facilities management and moves towards open-planned offices, the tone of the article emphasises the importance of appropriate and private space in which to think, contemplate and critically reflect. The importance of space in which to research planning education is equally important. Three remarks arising from the project are therefore pertinent in closing this paper.

First, there remains a strained relationship between research and teaching in institutions of higher education. Quality assurance mechanisms, such as the UK’s emerging Research Excellence Framework, emphasise the importance of quality research and the need for curricula to be research-led. This means that substantive disciplinary research needs to inform the design and content of planning curricula. An overemphasis on disciplinary research, however, risks squeezing out time and resources for research into planning education and the new pedagogies that exist. If the measure of quality of educational research is a scholarly publication in a journal with an appropriate impact factor, then the type of small-scale research discussed here risks being perceived at best as a *diversion* or, at worst, a luxury research departments can ill afford. Yet, *how* we teach affects *what* we teach.

Second, one can adopt a pragmatic approach to the scarcity of time and resources in contemporary academic life and seek to find creative ways in which to carve out the space to undertake pedagogical action research. Here, peer review, a variant of quality assurance with respect to teaching practice, might productively serve to offer critical and developmental feedback in relation to new technology adoption. Working in collaboration and acquiring ‘eyes in the back of one’s head’ is a constructive way to receive and offer peer support and feedback. In an often solitary activity, this is a luxury to be actively enjoyed. Interweaving this institutional requirement into an action research space then serves two purposes.

Finally, the luxury of writing a conference paper provides an opportune space to critically reflect on planning educators’ and planning researchers’ use of communication technologies, and to put forward some questions for future research. How many lecturers use PowerPoint slides for teaching and conference presentations for simply outlining lecture or research paper content, and then simply read the words on the slide? Does such an approach effectively communicate and resonate with the audience or learners? Does a tendency towards sharing PowerPoint handouts with students reduce their ability to construct sentences and arguments? Will such learned behaviours affect how they engage with their local communities and stakeholders? How many planning courses incorporate learning outcomes relating to oral communication skills that focus on the technical use of effective PowerPoint slides rather than the qualities of effective communication using a visual aid? And, critically, are models of two-way communication actively modelled in the classroom? In

mediating ideas, planners surely need to be able to interact, listen and incorporate in order to transform understanding rather than simply transmit information using presentational effects.

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