Choice at the pedagogy-technology interface:

Interactive whiteboards for learning

UTS Partnership Grant

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CHAPTER 1 INTRODUCTION AND METHODOLOGY

AIMS AND EXPECTED OUTCOMES

The aim of this research is to understand teachers' decisions about the adoption and adaptation of emerging technologies, in particular interactive whiteboards (IWBs). A secondary aim is to establish a research methodology for exploring choices regarding technology-mediated education.

This project provides a proof of concept test for a larger ARC study. This project uses deep qualitative analysis of teacher decision processes and the development of sophisticated survey instruments to measure teachers' attitudes and preferences towards technology use. We hypothesize that teacher experience, preferences and attitudes towards technology use and learner-centred teaching practices will help explain individual differences in technology use decisions. Such a pilot project is important to support an ARC application because it will provide insight into the complex decision processes that lead teachers to adopt, use or adapt new technology in their teaching. The findings will provide support for the ARC study that will exam the choices made by teachers related to pedagogy, technology and resources use.

Outcomes of this research are practical and theoretical knowledge: to promote effective pedagogy; to inform the adoption and adaptation of productive technologies; and to improve diffusion of good practices resulting in better student learning outcomes. Technology developers will be able to use findings to enhance the design of future digital technologies. The research methodology itself is an outcome of the study that will support future education technology research.

BACKGROUND

Developments in a plethora of classroom-based and informal learning technologies are fundamentally altering the nature of schooling (Aubusson et al., 2009; Thom, 2010). Teachers are at the interface of this educational change. Rarely have teachers been faced with so many challenging, rewarding, perilous, and costly technological and pedagogical decisions. The decisions made today will shape the nature and practices of education for years to come (Gilmore, 2010).

Technology is changing the way we live, learn and work. Consequently, Australia has embarked on a Digital Education Revolution (DER) and NSW is a key player. The Australian Government and the New South Wales Department of Education and Community (NSW DEC) have invested heavily in technology-led innovation in school education, with the aim of building a creative, well informed, digitally capable society with the diverse, flexible knowledge and skills to advance an unpredictable 21st century Australia. The choices being made now, by governments, schools and teachers, will profoundly influence Australia's future education, social fabric and national capability. Educational leaders and technological innovators are making critical decisions about what technologies should be made available; what pedagogies should be promoted; and how to provide professional learning for an aging teacher workforce. This aligns with the 2008 *Melbourne Declaration on Educational Goals for Young Australians* (MCEETYA, 2008) which lists as its Goal 2: For all "young Australians [to] become successful learners, confident and creative individuals, and active and informed citizens … [they will] have the essential skills in literacy and are creative and productive users of technology, especially ICT, as a foundation for success in all learning areas." (p. 41)

The Australian Government's Digital Education Revolution (DER) website points out the Government has committed $2.2 billion to the implementation of its DER. A stated intention in its online document *Digital Strategy for Teachers and School Leaders* is to "support teachers and school leaders to embrace technology and encourage them to creatively and effectively integrate the use of ICT into the classroom" (DEEWR 2011). Specific projects being supported by this strategy are:

- Teaching Teachers for the Future (Funding $7.8m)
- ICT in Everyday Learning: Teacher Online Toolkit ($825,000)
- Anywhere, Anytime Teacher Professional Learning ($5.4 million)
- Leading ICT in Learning ($2.1 million)

Aligned with these DER initiatives, on 31 May 2011 the Australian Government announced its Education and Skills Services through the new National Broadband Network. Minister Stephen Conroy announced the Gillard Government will provide $27.2 million in funding for "a four-year … program to support the development of online and interactive education training projects." (DBCDE media release, 2011)

NSW schools provide an extensive, fertile and authentic case for researching the impact of these initiatives and other key questions about our educational future (Cambourne, 2010). On 28 April 2011, the Premier of NSW, Barry O'Farrell (2011), announced that his new Government would spend $23 million on the rollout of 4,300 new IWBs to classrooms in 1,000 NSW DEC schools. As well, NSW DEC has progressed its DER Program with the roll-out of student laptops, customised Web 2.0 facilities, and a Connected Classroom in every school in NSW. These facilities provide IWBs and Video Conferencing (VC) capabilities. Schools themselves have raised considerable funds to supplement Government technological initiatives. For example, schools have purchased four times the number of IWBs provided directly by NSW DEC.

Schools are operating in an increasingly challenging national and international environment. There are high expectations that schools underpin the development of a knowledge economy; ensure the production of a technologically savvy society; respond to generational changes in patterns of engagement with technology; and exploit radical opportunities for 21st century learning. If the potential of educational technologies is to be realised, then teachers' choices play a crucial role in creating and enacting opportunities for technology-enriched pedagogy.

Teachers are using the technologies in many varied ways (Schuck & Kearney, 2007, 2008). This is not limited to varying patterns of use of IWBs and VC but also extends to mobile technologies, curriculum software, digital media production and engagement with Web 2.0 environments (Schuck & Aubusson, 2010). Pedagogies and practices associated with these technologies include genuinely innovative practices as well as replications of existing practice. Activities range from students and teachers simply accessing data and information to the creation and distribution of knowledge.

Choice lies at the heart of educational and technological progress. Teachers are located at the interface between technology, pedagogy and discipline expertise (Koehler & Mishra, 2008). They make decisions about what technologies they adopt and how they are used within their classrooms, within a framework of school technology provision and access. This research sets out to understand the choices teachers make as a pivotal first step to understanding the larger set of choices made by students, principals, leaders and designers. The choices these key players make have profound impacts on the educational outcomes for students.

Understanding what influences these choices will promote effective pedagogy; inform the adoption and adaptation of productive technologies; improve dissemination of good practices; and enhance the design of digital technologies, resulting in better student learning outcomes.

Research plan

This research project comprised two phases. In the first phase between September 2010 and December 2010 focus groups were conducted to develop and inform a survey instrument targeting IWB technology choices. In a subsequent part of phase 1, between January and March 2011, an IWB pilot survey collected a range of information from 200 teachers drawn from an Australia-wide commercial webpanel to investigate the relationships between attitudes and beliefs, access, and use of IWBs.

This first phase targeted IWB technology and concentrated on an investigation of teachers' experience, attitudes, and preferences toward technology use in the classroom, together with the technological and pedagogical decisions teachers make about technological innovation. The methods are mixed, employing internationally leading, quantitative survey methods supplemented with rich qualitative data gathering and analysis. This first phase developed and tested robust data-gathering instruments and analytical procedures. Findings provide significant information about school-based decision making and indicate the key influences that impact on teacher engagement with IWBs.

The second phase took place from July 2011 to June 2012. In this phase data were collected regarding choices about rich pedagogies associated with IWBs. A discrete choice experiment was trialled in this phase. The survey in which the discrete choice experiment featured was informed by phase 1 findings and built on the survey instruments used in phase 1. Rich task scenarios were developed for the discrete choice experiment informed by the literature on rich task characteristics.

Methodologies

Qualitative work in the form of focus groups around IWB use has been conducted for the Partnership Project. These research findings have been incorporated in the survey instruments. These instruments also provide data on how and why decisions are made about IWBs for education. Sample sizes were selected to develop and test research instruments. Data have been analysed using analytical procedures (including archetypal analysis) and standard qualitative methods. The focus of this research is to develop instruments for characterizing teachers according to their experience, attitudes, and preferences regarding technology use. These instruments and data will inform the development of choice surveys and a choice model in the proposed ARC Linkage study, to determine the factors influencing the technological choices teachers make.

A choice model is a mathematical equation that reports the probability of a specific choice outcome given the alternatives available and other contextual factors (Ben-Akiva & Lerman, 1985). Experiments designed to support the estimation of a choice model typically require respondents to make a number of actual choices in simulated situations specifically designed to reflect the variation of possible choices available to the study population (Louviere & Woodworth, 1983). Before designing and developing a large discrete choice experiment and subsequent choice model it is important to understand a) the environment in which teachers view and make their decisions about IWBs and b) the profiles of teachers making such choices. For example, environmental factors may relate to accessibility to their technology or types of students they work with; a teacher's profile may relate to how we can describe them in terms of their concerns about using technology and their perception of its roles in student assessment and learning.

The specific research outcomes attained at the conclusion of phases 1 and 2 of this project include archetypal profiles associated with patterns of use of IWBs for teaching and learning; hypothetical models of teacher decision making processes; circumstances that influence these processes regarding use of IWBs; insights as to how rich tasks align with use of different media and teachers' pedagogical preferences; and prototype survey instruments scalable for a national study investigating the teacher choices that determine technological and pedagogical innovation.

Research Team

Along with the obvious partnership being fostered between UTS and Electroboard by this project, the research will continue the already successful collaborations between UTS academics from diverse theoretical and methodological backgrounds, along with fostering trans-disciplinary knowledge sharing among two of UTS's research strengths — Centre for Research in Learning and Change (CRLC) and Centre for Study of Choice (CenSoC). The success of the research team in being able to manage and deliver the challenges of trans-disciplinary research (including linking knowledge obtained from qualitative and quantitative methods) is evidenced by the team's previous collaborative work with the NSW DEC. That study involved completing a four and a half year longitudinal study (with Schuck, Aubusson, and others from CRLC, and Louviere and Burke from CenSoC) on teacher retention. The current collaboration to investigate the pedagogy-technology interface, between members of CRLC and CenSoC is supported by a continued understanding of each other's expertise and roles, which we briefly expand upon below.

CRLC investigates the changing contexts and practices of contemporary life resulting from globalisation, increased mobility and new technologies. The program of research in the Pedagogical Practice and Innovation (PPI) research stream of CRLC investigates the kinds of teaching practices, learning environments and alternative forms of schooling that might be appropriate now and in the future. It explores learning in both formal and informal contexts and provides insights into learning and schooling futures that align with (and contribute to) changes in society.

CenSoC are the international thought leaders in the field of understanding and innovatively solving problems regarding human choice behaviour, developing leading edge choice research methodologies, and delivering user-inspired value. CenSoC is internationally renowned for the development of choice related quantitative methods to address issues like the one targeted in this research.

Sandy Schuck is a Professor in Education and a convenor of the Pedagogical Practice and Innovation (PPI) research stream of CRLC. She is Head of Research Degrees for FASS. Her research interests focus on teacher learning with new technologies; the retention of early career teachers; and the teaching and learning of mathematics in primary schools.

Peter Aubusson is an Associate Professor in Education and Head of Teacher Education Programs in FASS. He is a convenor of the PPI research stream of CRLC. He is the President of the NSW Council of Deans of Education. His recent research has concentrated on teacher professional learning models and adolescent engagement with emerging technologies together with their implications for learning.

Matthew Kearney is a Senior Lecturer in Education and a core member of the PPI research stream of CRLC. He is the Coordinator of the B.Teaching (Secondary) in Teacher Education. He coordinates and leads the Teaching Teachers for the Future project in Education at UTS. His teaching interests are in the areas of ICT and e-learning.

Paul Burke is a Senior Lecturer in Marketing Discipline Group, in the UTS School of Business, and Associate Member, CenSoC, with an extensive background in applied and theoretical aspects of choice modelling and human decision making behaviour. He has a strong track record working with profit and not-for-profit organisations. Much of this work has been possible through an ARC Linkage Grant, along with a UTS Commercial and a Challenge grant. He balances this with his understanding of teaching and its requirements through work with the NSW DEC. He has also received institutional and national recognition for his teaching of statistics to undergraduate students.

Bart Frischknecht is a Senior Research Fellow at CenSoC. He has academic and industry expertise in new product development. His academic background is in mechanical engineering with an emphasis on product design and the interaction between product design and consumer demand. Since joining UTS in January 2010 he has been engaged in multiple research projects measuring and analysing preferences and choice with industrial and academic partner organizations including Sawtooth Software, Motorola, Uni. of Notre Dame, and Uni. of Waikato.

CHAPTER 2 LITERATURE REVIEW

This literature review is divided into three parts. The first part focuses on recent research into Australian school teachers' attitudes to and use of information and communications technologies (ICT) generally and interactive whiteboards (IWBs) particularly. For background information, the international literature will be canvassed briefly. The second part looks at the literature regarding rich tasks that informed the development of the discrete choice experiment in phase two. The third part looks at the literature informing the development of choice modelling, which is one of the key research methods to be adopted in our future Linkage project.

TEACHERS' ATTITUDES TO AND USE OF ICT AND IWBS

In the past decade there has been a surge of international and Australian research into teachers' use of ICT and IWBs in education and with it a concomitant number of literature reviews. Examples of recent comprehensive literature reviews are Daly et al. (2009) and Mumtaz (2000) on the continuing professional development of teachers using ICT, and Miller and Glover (2010), Higgins et al. (2007) and Schuck and Kearney (2007) on teacher use of IWBs in schools. Some of these will be referred to again, but the intention of this part of the literature review is to highlight recent Australian studies.

This part of the literature review is divided into two sub-sections: the first is Australian research, and the second is English-language, international research. Each of these sections begins with ICT research and moves to IWB research.

RECENT AUSTRALIAN RESEARCH

In his report to the OECD on the use of ICT in education in Australia, Ainley (2010) draws on data supplied by state educational authorities to suggest that around 90% of Australian teachers had at least basic competencies in ICT, and 50% regarded their competency as 'intermediate' or 'advanced'. In Western Australia, Bate (2010) conducted a longitudinal study with 35 beginning teachers over three years to examine how they used ICT in their first three years of teaching. He found that the teachers involved in the study did not use ICT in ways that were consistent with their pedagogical beliefs. While teachers may hold pedagogical beliefs that align with contemporary student-centred theories of learning, none of their participants employed ICT in way that reflected these beliefs. The research found a "complex mix of constraints" that contributed to a lack of creativity in these teachers' use of ICT. (p. 1052).

Prestridge (2010) examined the types of teacher beliefs that influence ICT practices in Queensland classrooms and the alignment of these beliefs to current pedagogical reform. She identified four types of digital pedagogies that teachers were responding to. She calls these 'foundational', 'developing', 'skill-based', and 'digital'. Teachers who respond to the 'digital' category will be most likely to enable the development of the digitised curriculum.

Phillips (2010) studied the specific relationship between the enactment of teachers' beliefs through their lesson planning and their verbalised or espoused beliefs about teaching and learning with ICT. He suggests teachers' enacted planning practices do not necessarily reflect their espoused beliefs about the use of technology. Significant factors affecting this are (i) teacher self-efficacy, skill and knowledge and professional development opportunities, (ii) perceived student skill level and knowledge, (iii) perceived influence of the school administration, and (iv) the extent to which a teacher believes technology can enhance pedagogical practice and student learning.

In their report to NSW DEC, Schuck and Kearney (2007, 2008), identify over 40 different uses of IWBs in K-12 lessons they analysed. Their project confirms the strength of IWBs as an organisational tool in classrooms and found that whichever way IWBs are employed they are likely to stimulate K-12 students' learning. Innovative teachers can use IWBs dialogically to enhance students' authentic learning and encourage a 'disruptive pedagogy' (2007, p. 72) that gives students autonomy and self-direction in lessons and a voice in whole-class interactions. Even when IWBs are used with more traditional pedagogic approaches they may still facilitate new ways for students to learn. Vincent's (2007) case study in a Kindergarten classroom also reports the positive impact of IWBs on classroom pedagogy, especially when teaching styles match the technology's affordances.

Schuck and Kearney (2007) also found that both school executives, particularly principals, and teachers valued IWBs as vehicles for teacher learning about technology, for ease of preparation and for teacher reflection about practice. While not all teachers understood or fully exploited the technological capacity of IWBs as ICT devices, some older teachers reported a rejuvenation of their teaching with the use of IWBs. The authors suggest further research is needed on how the presence of the IWB in teaching rooms might change teachers' attitudes to the use of the equipment and how their use can contribute to the formation of new pedagogies (see also Schuck & Aubusson 2010; Aubusson et al. 2009).

Lee and Betcher (2009) title their book *The interactive whiteboard revolution — Teaching with IWBs* because they see IWBs having a profound impact on both teaching and schooling around the world over a relatively short amount of time. Lee's (2010) Australian research found that teachers initially maintained their existing pedagogical styles with IWBs, ranging from strongly teacher-centric to strongly student-centric. After taking about a year to become comfortable with the technology, teachers began to explore new ways of using IWBs, most notably as digital hubs (p. 138). Lee (2010, p. 134) further suggests: "what is important in an organisation moving to the digital mode is the normalisation of the digital by the total staff and not how well the staff use the technology."

Way et al. (2009) conducted five small-scale qualitative studies on IWB use in Sydney schools. They concluded that teachers often tend at first to use IWBs with teacher-oriented approaches but gradually change to child-centred pedagogies. Teachers' creativity with IWBs relied not only on their own enthusiasm but also on informal support from other teachers. Problems that inhibit teachers' use of IWBs include technical difficulties, inadequate training, and the time-consuming nature of the technology. The age of the teacher seems not to be a contributing factor to teachers' uptake of IWBs so much as their confidence in the value of the technology. They found that IWBs not only appeal to students (mostly boys) with higher visual-spatial intelligence but also help develop this intelligence in other students. An implication of this finding is that teachers may also respond to IWBs in a similar fashion.

Drawing on the work of Glover and Miller (2001, 2003), Way et al. (2009, p. 10) classify teachers into three typologies according to their acceptance and integration of IWBs into their teaching practices:

- ‘Missioners’ are those teachers who are changing their teaching approaches in order to integrate the IWB and are encouraging other teachers to do likewise.
- ‘Tentatives’ are teachers who are inhibited by the need for further training or by fear of the time required to become competent.
- ‘Luddites’ are teachers who are opposed to the use of IWBs, despite having appropriate access to training and equipment.

Sweeney (2010) investigated the use of IWBs on seven teachers’ pedagogy in a NSW primary school over an 18-month period. Using the NSW Quality Teaching Framework, she drew on activity theory to investigate the “dialectical processes by which teachers’ consciousness, professional learning and development simultaneously shape and are shaped by the use of IWBs.” The results of her study indicate that for both new and experienced IWB users, participation in ongoing professional development can be valuable if tailored appropriately. New teachers need more technical skill rather than pedagogical change. Teachers with at least two years IWB experience are more receptive to changing their pedagogical techniques to improve student learning.

Building on Kennewell’s (2004) concept of interactivity, Latheef and Romeo (2010), have developed a research design using the Cultural-Historical Activity Theory (CHAT) framework. This is an innovative approach for examining the application of IWBs and their potential in education by comparing and contrasting interactivity in a number of primary classrooms equipped with IWBs. CHAT allows for richer and deeper analyses of teaching and learning because it takes into account the cultural-historical factors that impact on research participants.

In a special issue of the *Australasian Journal of Educational Technology* [2010, 26, 4] called “Interactive whiteboards: An Australasian perspective”, editors Thomas and Jones (2010) brought together ten papers by researchers in Australia, New Zealand, Taiwan and Singapore. The papers reinforce the concept that teachers, rather that IWBs, are responsible for transforming existing pedagogies. Two of these papers, by Dawson (2010) and Winzenried, Dalgarno and Tinkler (2010) are summarised here.

Dawson’s (2010) exploratory research into the application of networked IWBs (NIWBs) in regional Australian higher education suggests their value as a networking tool for remote campuses beyond that of the video conferencing facilities they may already use. NIWBs are defined as being synchronously connected together through networked computers (p. 526). They allow for lecturers’ interactions with students across distance using gesture and annotation, and student collaboration between sites for group processes.

Winzenried et al. (2010) suggest their research on teachers’ use of IWBs has important consequences for teacher professional development in two ways. First, flexible and responsive teachers used it to complement their teaching styles, but others did not have to change their styles while they used it. This means IWBs can be used initially without requiring teachers to transform their pedagogies, and that any necessary pedagogical changes may occur over time. Second, IWBs afforded a clear increase in student engagement through wider access to suitable resources. Further, they observed that informal peer discussions that allow quick resolution of technological problems are more likely to be of benefit to teachers than formal standardised workshops.

In their research with Chinese language students at a secondary school in Sydney, Xu and Moloney (2011) found these students endorsed the use of IWBs, particularly for various aspects of their language learning. The positive attitude of the teacher to the value of IWBs was found to play an important role in the implementation and success of the technology.

Recent international research

The emerging international scholarship on teacher attitudes to and use of ICT in primary and secondary education has been discussed by a number of researchers in recent years. Voogt and Knezek (2008) indicate that teachers' use of ICT is affected by their attitudes, competence, and access to technology. Somekh (2008) also argues that teachers are not necessarily to blame when schools do not take up ICT in innovative ways. Whatever their individual attitudes and beliefs, teachers are bound by regulatory frameworks and socio-cultural restrictions. These need to be addressed if schooling is to be transformed by ICT. Indeed, leaders within organisational structures also need to permit and encourage teachers to use appropriate new pedagogies.

A series of BECTA reports has investigated technology-enhanced learning and the continuing professional development of teachers using ICT in the UK. Sharples et al. (2009) suggest that professional knowledge and fluency are strategic issues to be developed by teachers in schools. This extends beyond technical competence to embracing and orchestrating the understanding of new technologies and new relationships with students. In their literature review on ICT CPD, Daly et al. (2009) specifically address the question of why, despite the vast majority of teachers in the UK receiving some form of continuing professional development in ICT, its use seems to have had very little impact on everyday practice. Pachler et al. (2010) report that teachers would welcome more debate about the educational effectiveness of ICT, and recommend that an overarching national online community of practice be set up to provide access to CPD and expert providers. BECTA (2010) also initiated a pilot study called "Assessing practitioner e-maturity", which was intended to develop a benchmarking tool to measure practitioner ICT capability in Further Education.

The increasing amount of research into IWB use in schools also comes largely from the UK. In a meta-analysis of research on IWBs, Kennewell (2006) notes that IWBs have met with widespread interest and high rates of adoption in UK schools. Other reported benefits of IWB usage include significant teacher satisfaction, flexibility, efficiency, motivation, support of preparation, ease of use and suitability for whole class teaching (Smith et al., 2005; Becta, 2008). Hall and Higgins (2005) suggest that IWBs are mainly being used to reinforce traditional teaching approaches. Indeed, Kennewell (2006) notes that the use of the IWB does not require any great changes from the mainstream teacher-directed approaches endorsed by the UK Department for Education and Skills.

Hennessy and Warwick (2010) edited the conference papers for the 2009 International Conference on Research into Teaching with Whole class Interactive Technologies (RITWIT). This conference looked beyond just IWBs to ask how a range of technologies can facilitate or inhibit whole-class school teaching. Littleton (2010) highlights the sorts of professional development teachers need as they modify their pedagogies and practices to meet technological change due to IWBs in their classrooms. Beauchamp et al. (2010) develop the musical metaphors of orchestration and jazz improvisation to describe the performance aspect of a teacher's role and the serendipity of classroom events involving interactive technologies.

Developing this metaphor further, they explore the literature on interactivity with ICT and argue that a shift towards a greater role for learners in “orchestrating” (p. 759) classroom resources will be valuable. As well, there is potential for ICT to increase support for more dialogic and synergistic approaches to group and individual work.

The theory, research and practice of IWB use in education is comprehensively analysed in Thomas and Schmid’s (2010) book. It begins with a literature survey by Miller and Glover (2010), who say that there is little reported research into the ways teachers adapt practice and pedagogy when given the opportunity to use IWBs. They conclude that the “IWB will only be of lasting significance in enhancing student attainment if teachers are prepared to change their teaching approaches to a more interactive mode” (p.11). Otherwise, IWBs will remain little more than presentational devices and their long-term pedagogical capacity, especially through connection to the internet, may be lost. Initial teacher education and ongoing training and development of practising teachers thus become important to ensure expertise in all schools. This may be easier in primary schools, where the IWB is in constant use, than in secondary schools where there is more variability in subject compatibility and teacher attitude.

In a chapter of the book dealing with teacher professional development, Cogill (2010) draws on her empirical research, along with Shulman’s (1987) work on teacher knowledge, to present a theoretical model for teachers’ pedagogic change subsequent to IWB intervention. She also raises issues concerning the need for a theoretical framework on which future IWB research might be based. Cogill espouses the importance of background factors, such as a teacher’s beliefs, experiences and educational context about IWBs. If these factors are positive, the IWB changes teachers’ pedagogical practice through their planning and preparation, selection of classroom resources and abilities to teach for interactive learning.

Haldane’s (2010) chapter on teacher professional development presents a five-step model of IWB proficiency levels: Foundation–Formative–Facility–Fluency–Flying (pp. 186-187). To distinguish this model from normal CPD, Haldane calls it “transformative personal development”. The word ‘transformative’ implies that sustained learning periods with continuous access to IWBs, expert tuition and small communities of practice are needed for teachers to increase their proficiency, mainly because of the combination of pedagogical and technological expertise to be acquired. Schmid and Schimmack’s (2010) research into language teaching in Germany supports the idea of ‘bottom-up’, gradual, peer-focussed professional development, rather than ‘top-down’, one-day workshops that mainly address the technological aspects of IWBs.

RICH TASKS

In the discussion of ‘rich tasks’ it is important to distinguish between the terms Rich Tasks (upper case) and *rich tasks* (lower case, italicised here), as they appear in the Australian and international curriculum literature. The former is a registered trademark and applies specifically to the assessment component of the New Basics curriculum (Education Queensland, 2001). The latter is a more generic term that may reflect some of the Rich Tasks concepts and be quite sophisticated in its descriptions, but would not necessarily be aligned with the underpinning philosophy of New Basics. We begin this section with a brief overview of the concept of Rich Tasks. This will be followed by a discussion of *rich tasks*.

The New Basics curriculum was introduced as a trial in a limited number of government schools in Queensland (Luke, 1999; Education Queensland, 2001) between 2000 and 2003 and has since been replaced by other curriculum policies, including the Australian Curriculum (Shegog, 2010; Lowrie, Logan & Scriven, 2012). The underpinning philosophy of New Basics is Reconceptualism (State of Queensland, 2004, p. 3). Reconceptualist theory advocates a holistic approach to curriculum whereby teachers combine Deweyan and Vygotskyan understandings of child centredness with principles of equity, diversity and social justice (Luke, 1999; Tzuo et al. 2011). For Graham (1992, p. 27), a reconceptualist curriculum 'acknowledges the student's search for meaning as an interactive and reflective process undertaken in a social milieu.' This contrasts with the behaviourist, Tylerian curriculum paradigm to which many teachers will have become accustomed (Weir, 2005; Dwight & Garrison, 2003).

Luke (1999) reports that New Basics is predicated on the intention of closing the "achievement gap" (p. 3) between the highest and lowest achieving students in schools. The New Basics framework is designed to accomplish this through the alignment of three strategies available to educators: curriculum, pedagogy and assessment, which Education Queensland (EQ) labels respectively, 'New Basics,' 'Productive Pedagogies' and 'Rich Tasks' (pp. 5–6).

The intention of a Rich Task is to highlight both the quality of the learning outcome and the intellectual strategies students acquire in the process of completing the task and to guide curriculum planning across a significant span of schooling. For the Queensland State Education *New Basics Project*, a Rich Task is defined as:

> a culminating performance or demonstration or product that is purposeful and models a life role. It presents substantive, real problems to solve and engages learners in forms of pragmatic social action that have real value in the world. The problems require identification, analysis and resolution, and require students to analyse, theorise and engage intellectually with the world. In this way, tasks connect to the world outside the classroom.

(*New Basics Project*, Education Queensland, 2001, p.5)

Rich Tasks were designed to be sets of 'substantive, life-like activities that students undertake over a three-year period, culminating in a demonstration or performance or product in the final year of the three-year period' (Cooper, Nuyen & Baturo, 2003). Rich Tasks are distinguishable from short-term projects, for example. They require teachers to adopt new approaches to teaching, learning and assessment. In order to complete a Rich Task, students would demonstrate how they developed knowledge, skills and processes that envelop a number of disciplines, practices and fields of knowledge.

The transdisciplinary nature of Rich Tasks means that there are no specific Rich Task titles related to mathematics only. Cooper et al (2003) analysed the issues affecting the integration of Rich Tasks and mathematics. Of the 20 titles in the suite of Rich Tasks for the period of the EQ trial, only two explicitly mention the word 'mathematical' (pp. 9–10), even though mathematical ideas would be embedded in many, though not all, of the other tasks. Cooper et al. (2003, pp. 48–49) report that Rich Tasks support mathematics that is related to investigation and presentation, but not abstraction or concept development. For example, patterns, area and liquid volume are not explored in any Rich Task for Years 4 to 6. In this view, Rich Tasks are inadequate on their own for the teaching, assessment and reporting of mathematics learning, and there are major components of mathematics (e.g. concept development) that must be taught outside of Rich Tasks (p. 51).

Australian teachers, Downton, Knight, Clarke & Lewis (2006, p. 9), give a checklist of *rich task* attributes for junior primary to junior secondary school mathematics (while saying it would be rare for every task to match the complete list). For them, rich assessment tasks:

- connect naturally with what has been taught
- address a range of outcomes in the one task
- are time-efficient and manageable
- allow all students to make 'a start'
- engage the learner
- can be successfully undertaken using a range of methods or approaches
- provide a measure of choice or 'openness'
- encourage students to disclose their own understanding of what they have learned
- allow students to show connections they are able to make between the concepts they have learned
- are themselves worthwhile activities for students' learning
- provide a range of student responses, including a chance for students to show all that they know about the relevant content
- help teachers to decide what specific help students may require in the relevant content areas
- authentically represent the ways in which the knowledge and skills will be used in the future

Taking an international perspective, Shimizu, Kaur, Huang and Clarke (2010, p. 10–11) suggest a 'rich' task signifies "a task of sufficient complexity as to admit a variety of approaches and therefore to have the capacity to reveal differences in student conceptions of relative mathematical concepts and procedures." They list the attributes of rich mathematical assessment tasks that would invite a range of student responses and allow students to disclose their levels of competence and understanding. These attributes agree substantially with the ones listed above.

In Finland, from Grade 1 students engage in solving real and appealing problems, starting with symbols and moving to the use of more complex language. The exemplary nature of the Finnish approach to problem solving in school mathematics education has been acknowledged by U.K. Department of Education (Ofsted, 2010).

Grootenboer (2009) describes how *rich tasks* were conceptualised for an Australian Research Council Linkage project called *Maths in the Kimberley* (MITK). Based in six schools in the Kimberley region of Western Australia, this project was designed to enhance the mathematical learning of indigenous students. He drew on two diverse approaches to tasks: Education Queensland's *New Basics* (Rich Tasks) program, and Boaler and Staples's (2008) five-year longitudinal study of non-traditional mathematics teaching at the ethnically diverse "Railside" High School in California. Grootenboer identified the following six aspects of *rich tasks* for the MITK pedagogy (p. 697):

- academic and intellectual quality

- group work
- extended engagement [e.g. over a 90-minute session]
- catering for diversity through multiple entry points, multiple solution pathways [to include in the groups students with different interests, backgrounds, and thinking and learning capacities]
- connectedness [with other mathematical concepts and with real-world problems]
- multi-representational [so that students and groups can express a variety of solution paths]

Recent policy changes introduced by the Commonwealth Government means the new Australian Curriculum (ACARA, 2012) will now guide teaching, learning and assessment in Australian schools using KLAs (Shegog, 2010). Lowrie, Logan and Scriven (2012) express concern that the geometry and measurement strands are not rich enough to allow the simultaneous investigation by students of concepts such as perimeter-area, area-volume, volume-capacity.

CHOICES AND DECISIONS ABOUT ICT USE

Choices are often studied using aggregate choice data (e.g., the number of cars that use the Lane Cove Tunnel). In contrast, choice modellers study choices made by individuals by obtaining data on their choice patterns, and try to explain/predict the choices by observing variables that vary across choice options for each individual.

Theory and methods have been used to study choices since Thurstone (1927) developed the method of paired comparisons based on what we now call "random utility theory". Several key modern developments underlie the work in this project, such as Daniel McFadden's Nobel Prize winning work in developing theory and associated statistical methods for analysing and modelling multiple choices instead of only paired choices; discrete choice experiments (DCE) based on McFadden's work by Louviere and Woodworth (1983) and Marley and Louviere (2005).

A DCE is a statistical experiment that allows an experimenter to estimate the parameters of a particular discrete choice model. Specifically, a DCE is a sample of choice sets drawn from all possible choice sets for a particular set of choice drivers and their associated levels. The sample is drawn in such a way that particular types of choice models can be estimated and tested. The choice model being developed in this project takes into account the Technological Pedagogical Content Knowledge (TPACK) Framework, Concerns-Based Adoption Model (CBAM); teacher pedagogical beliefs and assessment preferences. TPACK and CBAM are discussed further below.

The interaction of technological knowledge with Shulman's 'pedagogical content knowledge' (Shulman 1987) has been widely accepted as a useful framework for thinking about teachers' knowledge of how to integrate ICTs to enhance learning in their curriculum areas. This type of teacher knowledge has been labelled 'TPACK' by Koehler and Mishra (2008), who describe it as a productive framework for thinking about the interaction between teachers and technology. This construct is built on the idea that teachers need to be knowledgeable in three separate areas (technology, pedagogy, and content) and in the combination of those three areas in order to integrate technology successfully for enhanced learning outcomes.

TPACK provides a framework for testing hypotheses about the impact of teacher professional development or other classroom interventions such as technology introduction on teacher behaviour and student learning outcomes. However, the current operation of the TPACK framework relies on teacher's self-reported capabilities in each of these areas. Such an approach makes it difficult to articulate relationships among teacher behaviours; teaching styles, preferences and beliefs; and student learning outcomes. Albion et al (2010) describe a survey instrument designed to measure teachers' and pre-service teachers' confidence with respect to teachers' TPACK. They suggest TPACK represents the knowledge likely to be required of Australian teachers to achieve the intent of the Australian Government's DER. They call their quantitative instrument the *TPACK Confidence Survey*.

Dunn and Rakes (2010) developed a specific hypothesis that teachers' learner-centred beliefs and teacher efficacy beliefs would influence the type and degree of concern that the teachers experienced, regarding technology use in their classroom. They used well-established instruments for assessing teachers' learner-centred beliefs (McCombs & Whisler, 1997) and teacher efficacy beliefs (Tschannen-Moran & Hoy, 2001) to test their hypothesis. They sought to relate these measures with a measure of teacher concern about consequences to student outcomes, of technology use in class. In turn, they proposed that teachers with higher levels of consequence concerns regarding a technology innovation are more likely to promote effective use of technology in classrooms in accordance with the concerns-based adoption model (CBAM) (Hall & Hord, 2001; George et al., 2006). The study found a statistically significant relationship between the pair of independent variables and the measure of teacher concern. Teacher efficacy belief alone also had a significant effect. While the observed effect was modest, it is an appealing result because, as the authors highlight, learner-centred teaching beliefs and teacher efficacy beliefs can be influenced by professional development activities, teacher experience, and other controllable factors.

Over a three-year period, Hall, Chamblee and Slough (2011) examined IWB perceptions of two high school mathematics teachers using the Concerns-Based Adoption Model (CBAM) Stages of Concern Questionnaire and the Apple Classrooms of Tomorrow (ACOT) Model of Instructional Evolution. They found that IWBs provide some of the same benefits as computers and other technologies available in ACOT classrooms, namely increased student motivation, more dynamic instruction, and greater teacher collaboration. However, unlike the ACOT technologies, IWBs did not lead to the implementation of more project-based instruction.

In Australia, Jones and Vincent (2006) used CBAM to look at the impact on teachers and their teaching in one Victorian secondary school following the acquisition and installation of six IWBs and the employment of two half-time mentors in the technology. CBAM was used because it includes a developmental stage in which competent mentors share their knowledge and skills with peers.

Conclusion

This literature review focuses on three distinct aspects of this IWB study. The first is a survey of recent Australian and international research into teacher attitudes to ICT and IWB use. The second is a discussion of the characteristics of rich tasks, and the third is an overview of the quantitative research methodology that is a unique component of this project.

A recurring theme in the literature on teacher attitudes relates to formulating teachers' continuing professional development in ways that encourage enhanced interactivity between teachers and their students and between students and IWBs. Otherwise, IWBs are likely to remain little more than sophisticated but underused presentational devices. For some teachers, this may require adopting unfamiliar student-centric pedagogies. To develop and maintain a positive attitude to IWB use, the literature suggests that in addition to technical instruction, teachers should receive continuous access to technology, support from both supervisors and technical staff, and be included in intimate communities of practice.

The second part of the review indicated the important characteristics of rich tasks. The discrete choice experiments were framed around a number of elements that described a mathematical lesson on a given topic. These elements were: nature of task, task directions, collaboration, resources, assessment and follow-up. Each element was described using two levels of richness, drawing upon the rich task literature. Attributes of rich tasks that informed the discrete choice experiment were the following: connectedness, group work, the addressing of a range of outcomes in one task, provision of choice, intellectual quality, range of methods or approaches, allowing students to show the connections and understanding they have derived, and authentic representations of students' knowledge and skills in the future.

The final part of the review introduces the literature on choice experiments and other complementary research methods that will be used in the quantitative analysis of the choices and decisions teachers make about the use of ICT and IWBs. The incorporation of these methodologies into what is usually considered the domain of qualitative researchers is one of the innovative features of this project.

CHAPTER 3 FINDINGS FROM FOCUS GROUPS

Five focus groups were conducted by UTS researchers in September and October 2010. There were 35 teacher participants from DEC and Catholic schools and five participants were educators from Electroboard. While the data from the Electroboard group were very insightful, these have not been included in the findings below as they responded to different questions and participated to provide the research team with a different perspective than that of the users of IWBs.

The main purpose of the focus groups was to inform the development of data gathering instruments and, in particular, to inform the quantitative survey instrument and future construction of choice experiments. Nevertheless, the focus groups generated data in their own right which informs the research findings. Hence, findings related to the eight research questions are summarised below.

1. Are IWBs most often used in teacher-centred or student-centred approaches?

a) IWBs are mainly viewed as a presentation tool;

b) IWBs are less frequently used for collaboration and single or small group use than whole class teaching;

c) Particularly in high school, there is greater emphasis on teacher-centred use than in primary settings.

d) However, the nature of IWB use is influenced by a teacher's

- fundamental teaching beliefs, e.g., teachers with didactic dispositions seem more likely to apply didactic approaches;
- access and experience with IWBs, e.g. better access and more experience with IWBs is associated with more innovative use;
- year level, e.g. typical patterns of use in early primary, late primary and secondary classes differs;
- assessment patterns, e.g. the type of IWB was influenced by external and internal assessment, in that preparation for an external examination could promote teacher centred activity while internal assessment could promote student IWB use, such as student presentation.

2. How do teachers learn to use IWBs?

a) When learning to teach with IWBs,
the following were helpful:

- user group and Electroboard support
- sharing and peer tutoring
- just-in-time assistance.

b) However, participants would also like:

- inservices at different levels and leaders to support them
- well-tagged resource repositories
- ready-to-go resources — not having to create themes
- better and more frequent access to IWBs.

c) The following were hindrances:

- the DEC site was not perceived as user-friendly;

- mixed levels of expertise at inservice sessions made it difficult to have specific needs met by generalised workshop sessions.

d) In general: the following were associated with learning to use IWBs
   - Support: Where there is support, use is promoted
   - Confidence: As capability and confidence increase, use increases
   - Perceived value: An initial belief that IWBs are a useful teaching learning tool promotes engagement with IWBs and their use.

3. Why do you use IWBs? What made you use them? What activities are they better for? A push-pull dynamic?

The following factors were influential in encouraging use of the IWB:

a) Pressure to use IWBs from:
   - school principals and executive
   - teaching peers
   - parents and community
   - students' expectations
   - existence in classroom and therefore perception that it ought to be used and not be a wasted resource
   - teacher accreditation and performance evaluation.

b) Match with teaching style:
   - IWBs suit current teaching style;
   - with IWBs there is the capability to respond to student questions through access to prepared work or Internet.

c) Technological affordances and capabilities of IWBs:
   - storage and capturing facilities supporting reflection on, and planning for, lessons
   - technology is available and fits with a disposition to try new things
   - capacity to engage students, e.g. through stimulating visual resources
   - opportunity to refresh resources
   - capacity for lesson and activity re-use, sharing and adaptation
   - availability of software with effective learning activities and multi-modal capability e.g. speech and language activities
   - Internet access — sometimes spontaneous, capitalizing on teaching moments, e.g. access maps, Google Earth
   - filing and resource management
   - opportunities for creativity.

e) Teacher attitudes when first using the IWB varied. Some teachers:
   - find use of the board overwhelming
   - feel use impacts on confidence
   - love to learn new things
   - enjoy taking risks
   - said "Why bother?" as they had no access to boards.

4. **How is the IWB used?**

IWB use included:

a) Starter activities
b) Expansion of multimedia use
c) Access of expertise to explain concepts through video-conferencing
d) Lesson preparation
e) Spontaneous access to resources
f) Technical assistance from students
g) Storage of lessons and activities.

5. Do you have examples of creative pedagogy?

a) Authenticity, e.g. blogging with person walking through Amazon, parliament visit, real world race motion and calculations.
b) 'Snapshot' of event as teaching moment, making it accessible later
c) Virtual excursions
d) Shared blogging, widening audiences and parent participation
e) Connectivity, e.g. with iPod and video conferencing.

6. How do you know a particular IWB approach 'is working' with students?

a) Engagement/interest cues
b) Appears consistent with students' technology-rich environments.

7. Other observations:

a) Discussion raised questions about what is meant by interactivity. It became clear that there was a need to distinguish between interactive (social) learning and computer-human interface interactivity. The potential for student-teacher and student-student interaction is not fully realised.
b) Teachers' comments relating to interactivity included noting that:
   - when students present work, they listen and learn from each other
   - teachers can use the board to engage the whole class very quickly
   - students are 'interactive' when they can move things around on the board
   - hands-on interactivity allows for different learning styles.

8. Why are IWBs engaging?

a) Novelty factor
b) Where students are given control, students can play with it and find things it can do
c) Visual characteristics
d) Teacher professional community/team/mixture of internal & external networking/blended professional learning.

CHAPTER 4 FINDINGS FROM PHASE ONE SURVEY ANALYSIS

SUMMARY

The IWB pilot survey collected a range of information from 200 teachers. These teachers were drawn from an Australia-wide commercial webpanel. The summary statistics show that respondents represent a wide range of geographic locations, school environments, and school sizes. Also, teacher respondents varied by age, gender, experience, teaching level, and access to IWB technology. Given the moderate sample size and the third-party sampling approach, these results should be interpreted as indicative yet preliminary; they should not be used to describe Australia-wide frequencies, incidence, or opinions.

Three sections of the survey were adapted from existing instruments from the education literature. These items were designed to assess teachers' beliefs about teaching and learning, opinions about assessment techniques, and their perceptions of the IWB as a teaching innovation. A teacher's response to these items reflects characteristics about the teachers that may be difficult to observe otherwise. Additional sections of the survey collected demographic information, IWB availability and use patterns, and opinions about the IWB technology.

We analysed the data for relationships between the educational constructs (i.e., beliefs about teaching and learning, opinions about assessment, and perceptions about IWB technology) and observable characteristics (i.e., demographics, technology access, technology use behaviour) and attitudes about the technology.

The first section of the chapter summarizes the data according to teacher characteristics, school characteristics, teacher behaviour, and teacher beliefs.

The second section of the chapter describes three archetype profiles that illustrate differences between groups of teachers according to their stated beliefs about teaching and learning and about the IWB technology. Teachers with beliefs similar to those associated with a particular archetype profile are more likely to have characteristics and responses similar to those associated with that archetype.

The appendices present much of the survey data in table format with additional interpretation.

Summary of survey data

Teacher and school characteristics

Teachers

The teacher sample was split almost 50% between primary and secondary teachers. However, some teachers indicated that they taught in primary and secondary as can be seen by the totals in Table 1. For the remaining tables, we present teacher characteristics grouped according to teaching level (primary or secondary) and also as the total sample.

Table 1: Levels taught by teachers in sample

	Number	Percent
K-3	89	45%
4-6	63	32%
7-10	79	40%
11-12	61	31%

The sample consisted of approximately 75% female teachers and 25% male teachers, with a greater proportion of female teachers in primary schools (Table 2).

Table 2: Gender distribution in sample

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
Female	104	89%	60	64%	154	77%
Male	13	11%	34	36%	46	23%
Total	117	100%	94	100%	200	100%

There is a broad distribution of age ranges in both secondary and primary schools (Table 3). There were higher percentages of older teachers in secondary schools. Years of experience corresponded closely with age (Table 4).

Table 3: Age distribution in teacher sample

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
18-24 years	8	7%	4	4%	12	6%
25-29 years	24	21%	12	13%	35	18%
30-34 years	20	17%	13	14%	33	17%
35-39 years	16	14%	14	15%	28	14%
40-44 years	13	11%	8	9%	20	10%
45-49 years	7	6%	9	10%	16	8%
50-54 years	10	9%	14	15%	23	12%
55-59 years	13	11%	13	14%	24	12%
60-64 years	4	3%	5	5%	6	3%
65-69 years	1	1%	2	2%	2	1%
70 years and over	1	1%	0	0%	1	1%
Total	117	100%	94	100%	200	100%

Table 4: Distribution of years of experience in sample

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
0-2	19	16%	7	7%	26	13%
3-5	28	24%	11	12%	37	19%
6-10	25	21%	16	17%	41	21%
11-15	6	5%	17	18%	22	11%
16-20	9	8%	8	9%	16	8%
21-25	9	8%	10	11%	18	9%
26-30	11	9%	13	14%	23	12%
31+	10	9%	12	13%	17	9%
Total	117	100%	94	100%	200	100%

Slightly more than half of the teachers were full time. More than 20% were part time, and the remaining teachers were spread between casual, temporary blocks, and away from teaching (Table 5).

Table 5: Distribution of teaching status in sample

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
Full time	58	50%	59	63%	114	57%
Part time	28	24%	23	24%	45	23%
Casual	22	19%	6	6%	26	13%
Temporary blocks	4	3%	1	1%	5	3%
On leave from teaching for one year or less	4	3%	2	2%	6	3%
On leave from teaching for more than one year	1	1%	2	2%	3	2%
Retired	0	0%	1	1%	1	1%
Total	117	100%	94	100%	200	100%

Schools

The teachers surveyed live throughout Australia. Most were located in the major cities with several others from regional NSW, Victoria, and QLD (Table 6).

Table 6: Geographic location of sampled teachers

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
Sydney	28	24%	17	18%	45	23%
Other NSW	10	9%	15	16%	25	13%
Melbourne	19	16%	20	21%	38	19%
Other VIC	10	9%	6	6%	15	8%
Brisbane	10	9%	10	11%	16	8%
other QLD	12	10%	6	6%	17	9%
Adelaide	10	9%	9	10%	16	8%
Other SA	1	1%	0	0%	1	1%
Perth	4	3%	4	4%	8	4%
Other WA	2	2%	1	1%	3	2%
Canberra	5	4%	0	0%	5	3%
Other ACT	0	0%	1	1%	1	1%
Hobart	2	2%	0	0%	2	1%
Other TAS	1	1%	3	3%	4	2%
Darwin	2	2%	0	0%	2	1%
Othe NT	1	1%	2	2%	2	1%
Total	117	100%	94	100%	200	100%

There was a similar breakdown between metropolitan, provincial, and remote schools for both primary and secondary schools (Table 7), and a similar breakdown according to school type (Table 8).

Table 7: Distribution of school environment in sample

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
Metropolitan	80	68%	63	67%	136	68%
Provincial	27	23%	28	30%	53	27%
Remote	10	9%	3	3%	11	6%
Very Remote	0	0%	0	0%	0	0%
Total	117	100%	94	100%	200	100%

Table 8: Distribution of school type in sample

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
State	82	70%	60	64%	134	67%
Independent religious	11	9%	12	13%	23	12%
Independent secular	9	8%	8	9%	15	8%
Catholic systemic	15	13%	14	15%	28	14%
Total	117	100%	94	100%	200	100%

On average the sampled secondary schools have higher enrolments than the sampled primary schools (Table 9).

Table 9: Distribution of school size in sample

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
<50	8	7%	6	6%	12	6%
50-200	19	16%	5	5%	22	11%
201-400	42	36%	14	15%	51	26%
401-600	26	22%	10	11%	36	18%
601-800	12	10%	14	15%	25	13%
801-1000	6	5%	14	15%	20	10%
>1000	4	3%	31	33%	34	17%
Total	117	100%	94	100%	200	100%

Teacher and school characteristics related to IWBs

We asked teachers to estimate the number of classrooms in their school and then the number of IWBs in their school. From these numbers we estimated a percentage of classrooms with IWBs for each teacher's school (Table 10). There is a large number of primary schools with 100% incidence. There is a smaller number of primary schools with low incidence, and the remaining schools are distributed between low and high incidence. There is a large number of secondary schools with low incidence of IWBs and a small number with 100% incidence.

Table 10: Distribution of IWB incidence rate teachers' schools

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
10%	3	3%	26	28%	27	14%
20%	10	9%	22	23%	32	16%
30%	13	11%	13	14%	25	13%
40%	8	7%	6	6%	14	7%
50%	8	7%	6	6%	13	7%
60%	12	10%	3	3%	13	7%
70%	3	3%	4	4%	7	4%
80%	6	5%	1	1%	7	4%
90%	1	1%	3	3%	4	2%
100%	53	45%	10	11%	58	29%
	117	100%	94	100%	200	100%

Corresponding to the IWB incidence rate in schools, more primary school teachers have an IWB in their classroom, while the majority of secondary teachers either do not have access or they must book time with the IWB (either in a specific room or to be brought into their room) (Table 11 and Figure 1).

Table 11: Distribution of access to IWB in Sample

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
An IWB is in my classroom	65	56%	26	28%	86	43%
An IWB can be brought in if I book it	4	3%	8	9%	12	6%
I can use an IWB if I book the classroom where it is installed	25	21%	36	38%	58	29%
I don't have access to an IWB	18	15%	19	20%	34	17%
I have never seen an IWB used	5	4%	5	5%	10	5%
Total	117	100%	94	100%	200	100%

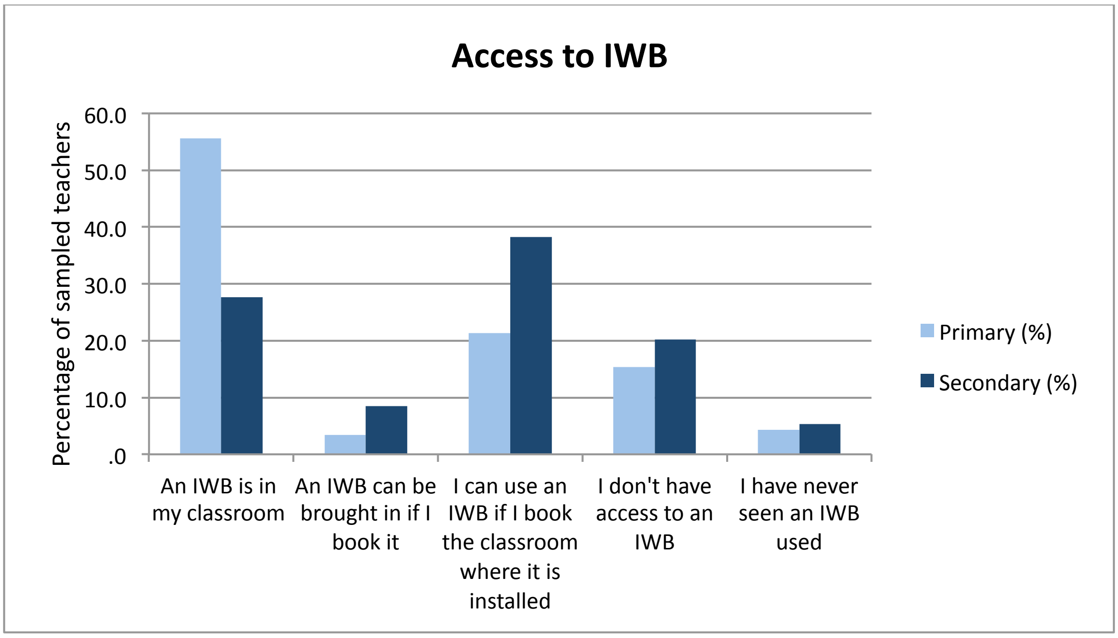


Figure 1: IWB access levels for primary and secondary school teachers in the survey sample

Five percent of the sample (10 teachers) had never seen an IWB. Of the remaining teachers, 50% had received training, and 50% had not. More primary teachers received training compared to secondary teachers (Table 12). Most of the teachers exposed to IWBs said they preferred more training compared to what they had received, and the most common forms of training for primary and secondary were training at school and interactions with other teachers (Table 13).

Table 12: Distribution of teachers who received IWB training (YES) and those who did not (NO)

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
Yes – training	61	52%	38	40%	95	48%
No – training	51	44%	51	54%	95	48%
Never seen IWB	5	4%	5	5%	10	5%
Total	117	100%	94	100%	200	100%

Table 13: The number of teachers that would have liked to receive more training from those who had been exposed to the IWB, and the numbers of those that received specific modes of training from those that had received training

	Primary		Secondary		Total	
	Number	Percent	Number	Percent	Number	Percent
I would like more training or support for the IWB than I have received	96	86%	66	74%	154	81%
Total	112		89		190	
I received support and training at my school	55	90%	36	95%	87	92%
I received support and training through user group sessions at other schools	18	30%	9	24%	25	26%
I received support and training through interactions with other teachers	45	74%	27	71%	68	72%
I received support and training through online user groups	6	10%	6	16%	12	13%
I received support and training through another source not listed here	6	10%	8	21%	14	15%
Total	61		38	100%	95	100%

TEACHER BEHAVIOUR

The survey contained several items that related to teachers' experience and behaviour with respect to IWBs. This section summarizes these data for primary and secondary teachers in the sample.

Primary teachers were much more likely to use the IWB throughout the whole lesson or as a starter activity than secondary teachers (Table 14 and Figure 2). This correlates well with the observation that primary teachers are more likely to have an IWB in their classroom (Figure 1).

Table 14: Patterns of IWB use in sample

U1. I use an IWB as part of my lessons	**Primary (%)**		**Secondary (%)**		**Total**	
Never	18	15%	35	37%	50	25%
Rarely	28	24%	33	35%	58	29%
Primarily as a starter activity	44	38%	10	11%	52	26%
Throughout the whole lesson	27	23%	16	17%	40	20%
Total	117	100%	94	100%	200	100%

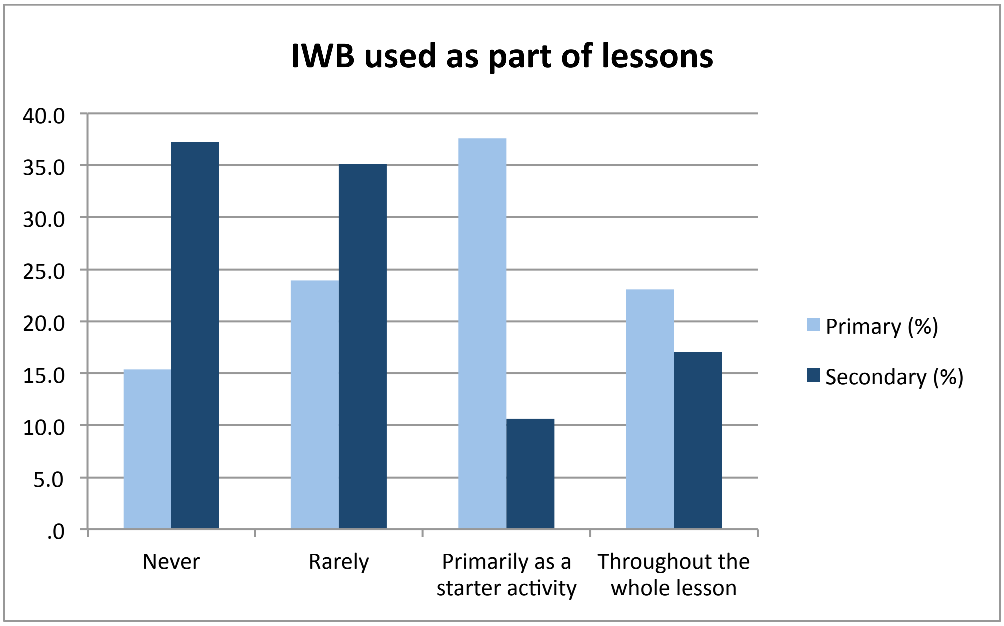


Figure 2: Comparison of patterns of use between primary and secondary teachers in sample

A higher percentage of primary teachers classified themselves as intermediate IWB users compared with secondary teachers (Table 15). There were similar percentages of advanced users.

Table 15: IWB experience level in sample

U2. I would characterise my experience with IWBs as	Primary (%)	Secondary (%)
Introductory	48.7	67.0
Intermediate	41.0	23.4
Advanced	10.3	9.6

Table 16-Table 20 show the percentage results only for those teachers that have access to an IWB for both primary and secondary teachers in the sample.

There are sizeable groups of teachers that reported having the challenges listed in Table 16. Secondary teachers reported much higher rates of challenges with gaining access to an IWB and finding time to prepare a lesson that uses an IWB. Finding time to prepare a lesson that uses the IWB was challenging for both groups.

Table 16: Reported challenges with using the IWB

U4. Challenges:	Primary (% yes)	Secondary (% yes)
Writing notes on the IWB	36.2	38.6
Only able to have one person use the IWB at a time	48.9	54.3
Getting access to an IWB because it is in a shared room or is shared between rooms	25.5	57.1
Naming, saving, and organising files	25.5	30.0
Finding time to prepare lessons that use an IWB	66.0	78.6

Primary teachers are more likely to report using various applications with the IWB (Table 17). Primary teachers are more likely to use Smartboard resources and games. Powerpoint is the top reported application for secondary teachers whereas this is only the seventh most reported application for primary teachers.

Table 17: Applications used with the IWB

U5 Applications used on IWB	Primary (% yes)	Secondary (% yes)
PowerPoint	61%	66%
Video playback	62%	57%
Video conferencing	11%	3%
As a whiteboard for drawing, notes, etc.	87%	64%
Games	73%	33%
Prepared lessons	65%	50%
Smartboard resources	69%	39%
Connection to Internet	81%	61%
Other	19%	14%

Primary teachers report higher usage of IWBs. Primary and secondary teachers report the same order of usage frequency for all items in Table 18 except for use during student presentations, which is the least reported use in primary and the fourth highest use reported in secondary schools.

Table 18: Use cases for the IWB

U8. I commonly use the IWB...	Primary (% yes)	Secondary (% yes)
For teacher delivery to the whole class	87%	69%
To show videos to the class	83%	67%
During classroom discussions	77%	57%
With the class or groups of students gathered close around the board	70%	40%
During small group activities	55%	36%
To create new content and share it with others	55%	36%
During student presentations	54%	54%

Lesson preparation patterns (Table 19) and classroom experiences (Table 20) are similar between primary and secondary teachers. The height of the board is more of a challenge in primary schools.

Table 19: IWB Lesson preparation patterns

U12. I prepare lessons that include the IWB...	Primary (% yes)	Secondary (% yes)
When I find the time	75%	77%
When I can find resources that others have created	72%	66%
When it is something that I know I can reuse again	69%	73%
For every lesson	16%	9%

Table 20: Classroom experience with IWBs

U15. My experience using IWBs	Primary (% yes)	Secondary (% yes)
I am always looking for new ways for the students to interact with the technology	83%	80%
The students can't reach very high on the IWB, so it is hard for them to use	59%	24%
An IWB is a regular feature in my classroom	49%	26%
I spend more time on preparation for lessons using an IWB	48%	46%
Lesson preparation is shorter	43%	26%
I wasted a lot of time making lesson plans when IWBs were first introduced because the technology didn't work like it was supposed to	42%	34%
Our school has a more economical version of the IWB, and it doesn't work as well as the more expensive versions	15%	17%

TEACHER BELIEFS

Table 21 summarizes the teacher responses to survey questions regarding teacher preferences, attitudes and beliefs with respect to IWBs. There are differences between primary and secondary teachers with primary teachers generally responding more favourably to the IWB. There are large groups of teachers that associate IWBs with enhanced student learning and engagement. There are smaller groups of teachers that would prefer to use a regular whiteboard, are inconvenienced by the effort to redo lessons, and think that the IWB distracts from educational content.

Table 21: Comparison of primary and secondary teacher responses to preference, attitude, and belief questions with respect to IWBs

Preference, Attitude and Belief Questions	Primary (% yes)	Secondary (% yes)
U12. I prepare lessons that include the IWB...		
Because the students enjoy the lessons more	81%	61%
Because it helps the students learn more	78%	59%
Because it helps me to be more organised	64%	56%
U15. My experience using IWBs		
The more students use the IWB the better	72%	51%
The IWB has helped me to be more efficient in preparing and revising lesson plans	62%	37%
IWBs seem like amazing tools, but it is hard to know where to get started	52%	61%
Changing my lesson plans to incorporate the new technology would take more time than I have	28%	49%
I am uncomfortable using an IWB	23%	27%
Changing my lesson plans to incorporate the new technology would take more time than it is worth	21%	26%
I would prefer to use a regular whiteboard	21%	37%
I find that students rely more on the teacher and the technology and are actually less engaged now that we have an IWB	14%	23%
I don't really see a need for this technology	10%	19%
U6. Important reasons to use the IWB		
Teachers should keep up with modern technology	96%	90%
It improves student learning	84%	75%
It is convenient	80%	80%
We can cover more material during lessons	69%	57%
The students expect it	55%	47%
It saves time in preparing lessons	53%	44%

U10. A valuable part of the IWB for me as a teacher is...		
I can engage the students in novel learning activities	95%	87%
I can reuse the lesson plans	88%	91%
It is easy to present media rich lessons	87%	81%
I am able to teach things in new ways (novel pedagogy)	87%	87%
I can adapt lesson plans from others	77%	74%
U13. Negative aspects of IBWs		
The IWB catches the children's attention	96%	89%
It takes a lot of effort to learn how to use the technology effectively	60%	64%
Using an IWB really isn't that different from how I was teaching before	37%	44%
I find it a significant inconvenience to redo my lesson plans for use with an IWB	34%	50%
Students now seem less engaged when I don't use the IWB in a lesson	30%	14%
The IWB gets in the way of other things I want to do	23%	30%
The IWB is not well-suited for the topics I teach	15%	19%
I think that an IWB distracts students from educational content	13%	21%
U14. Positive aspects of IWBs		
The IWB engages students in new ways	96%	81%
Learning to use an IWB and the notebook software is just like learning other programs	90%	89%
Using an IWB in class can lead to improved student outcomes	86%	79%
My class is more interactive now that we have an IWB	79%	49%
The students share more ideas and ask more questions now that we have an IWB	65%	43%

The next tables summarize the teachers' response to the teacher beliefs, assessment techniques, and stages of concern questions.

Teacher beliefs about teaching and learning

Table 22 show differences in the average response between primary and secondary teachers. Primary teachers had on average constructivist responses to five of the seven items, and secondary teachers had on average constructivist responses to three of the seven items. However, it should be noted that teachers in both primary and secondary schools had divergent opinions. This can be seen by noting that few questions had agreement or disagreement larger or smaller than 70% or 30%, respectively.

Table 22: Summary of teacher responses to the teacher belief questions

	Primary (% Agree)	Secondary (% Agree)	Overall (% Agree)
Instruction should be built around problems with clear, correct answers, and around ideas that most students can grasp quickly	64.1	68.1	65.5
Students will take more initiative to learn when they feel free to move around the room during class	52.1	37.2	44.0
Teachers know a lot more than students; they shouldn't let students muddle around when they can just explain the answers directly	15.4	12.8	14.0
How much students learn depends on how much background knowledge they have - that is why teaching facts is so necessary	54.7	50.0	52.5
Students should help establish criteria on which their work will be assessed	76.1	64.9	70.5
It is better when the teacher - not the students - decide what activities are to be done	39.3	52.1	46.0
A quiet classroom is generally needed for effective learning	40.2	44.7	42.0

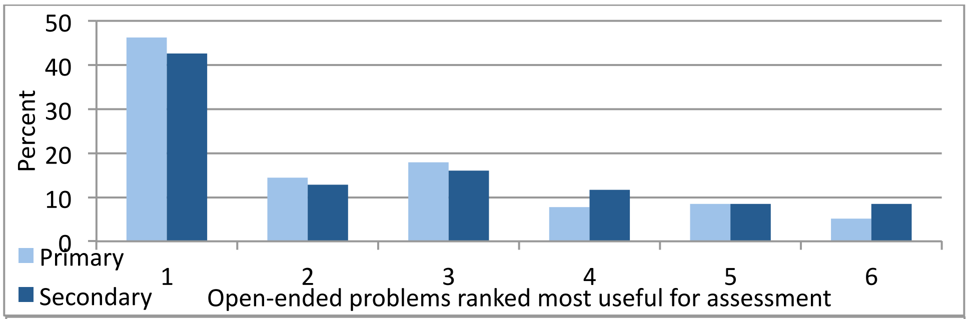
Primary and secondary teacher responses tended to be more constructivist in response to the paired statements (Table 23). However, primary teachers were more likely than secondary teachers to agree with the constructivist statement across all the statement pairs.

Table 23: Summary of teacher response to paired statements

Pair	Statement (from pairs) most agree with	Most agree with (%)	Primary	Secondary
1	I mainly see my role as a facilitator. I try to provide opportunities and resources for my students to discover or construct concepts for themselves.	62.5	62.4	61.7
	That's all nice, but students really won't learn the subject unless you go over the material in a structured way. It's my job to explain, to show students how to do the work, and to assign specific practice.	37.5	37.6	38.3
2	It's more practical to give the whole class the same assignment, one that has clear directions, and one that can be done in short intervals that matches students' attention spans and the daily class schedule.	34.0	23.1	44.7
	It is a good idea to have all sorts of activities going on in the classroom. Some students might produce a scene from a play they read. Others might create a miniature version of the set. It's hard to get the logistics right, but the successes are so much more important than the failures.	66.0	76.9	55.3
3	The most important part of instruction is that it encourages "sense-making" or thinking among students. Content is secondary.	77.0	76.9	76.6
	The most important part of instruction is the content of the curriculum. That content is the community's judgment about what children need to be able to know and do.	23.0	23.1	23.4
4	While student motivation is certainly useful, it should not drive what students study. It is more important that students learn the history, science, math and language skills in their textbooks.	22.5	17.9	26.6
	It is critical for students to become interested in doing academic work—interest and effort are more important than the particular subject-matter they are working on.	77.5	82.1	73.4

Ranking of Assessment Techniques

Primary and secondary teachers exhibited similar trends in the assessment technique ranking. Figure 3 shows the distribution of rankings for each assessment technique. Open-ended problems, individual and group projects, and student presentations were ranked as most useful in assessing student learning. However, all of the assessment techniques were judged very useful for assessing student learning by a majority of teachers except essay tests by primary teachers, which only 35% of primary teachers judged very useful (Table 24).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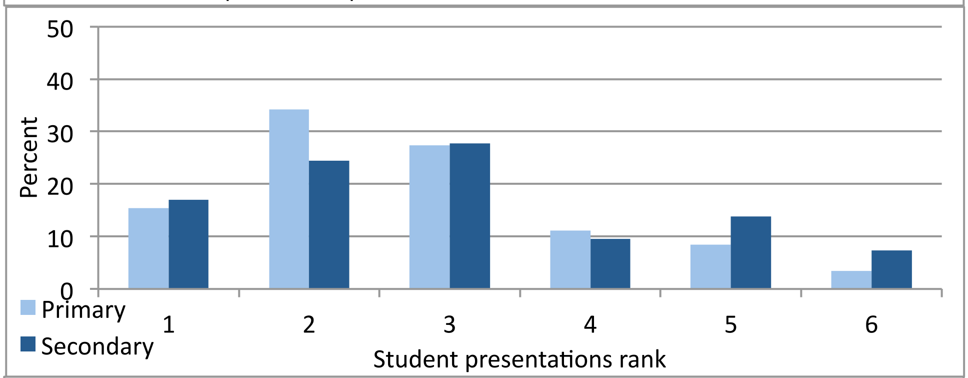
Open-ended problems ranked most useful for assessment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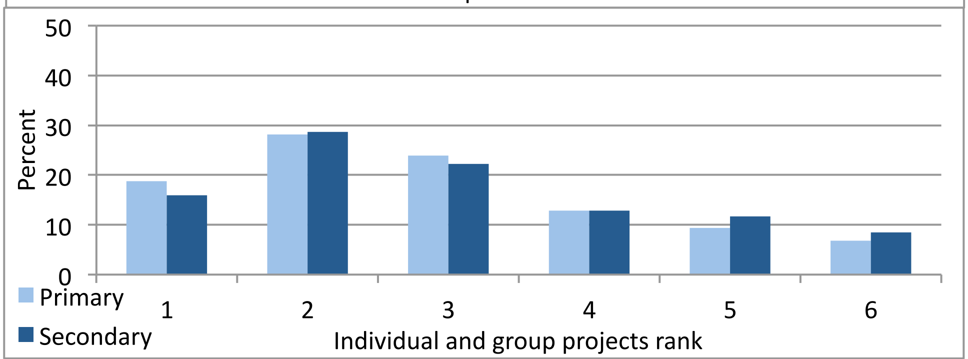
Student presentations rank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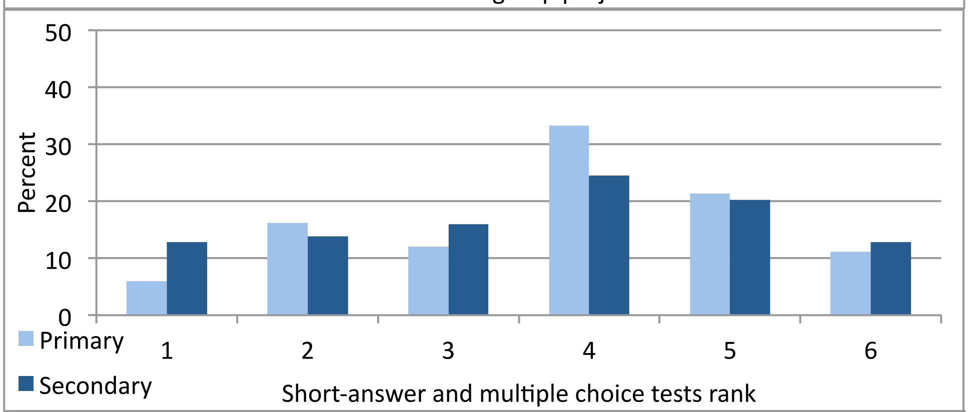
Individual and group projects rank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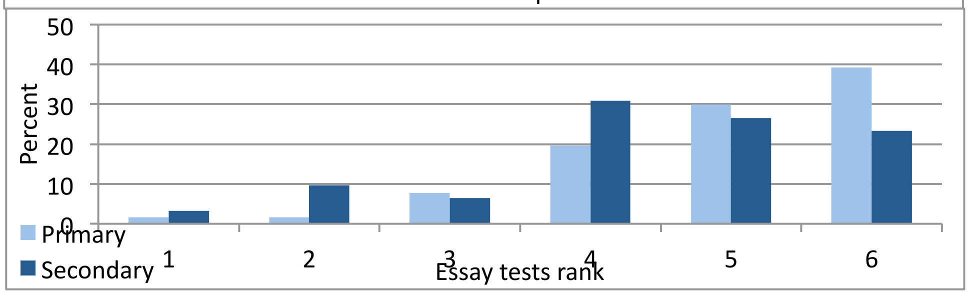
Short-answer and multiple choice tests rank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Essay tests rank

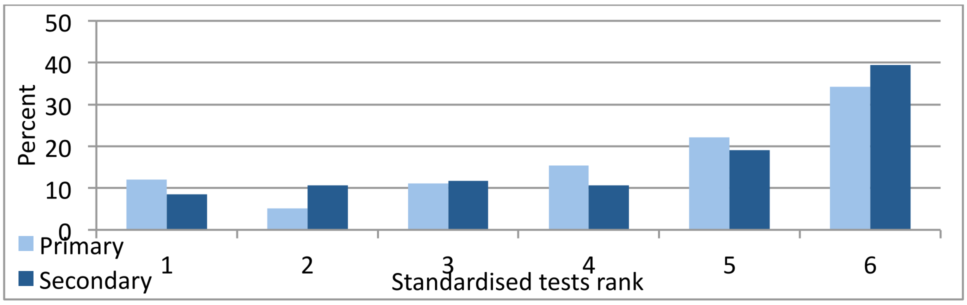


Figure 3: Distribution of assessment technique rankings for primary and secondary

Table 24: Summary of usefulness judgments on assessment techniques

Assessment techniques	Primary (% very useful)	Secondary (% very useful)
Individual and group projects	88.9	84
Open-ended problems	88	85.1
Student presentations and performances	88	81.9
Short-answer and multiple choice tests	65	70.2
Standardised tests	56.4	54.3
Essay tests	35	55.3

Stages of Concern

Seven stages of concern were used to describe the perceptions of teachers about IWBs. These include teachers in the early stages of becoming personally familiar and learning about IWBs and includes awareness (stage 0), informational (stage 1) and personal (stage 2) and management (stage 3). The latter stages refer to teachers becoming more concerned about the impact of IWBs of students and how they may be able to utilise the technology with colleagues. These stages are labelled consequence (stage 4), collaboration (stage 5) and refocusing (stage 6).

On average, Stages 5, 6, and 1 most accurately describe teachers' perceptions concerning IWBs (Table 25). On average, Stages 0, 2, and 3 least accurately describe teachers' perceptions concerning IWBs.

The mean, median, and mode of the stages of concern scores close to 0 for each of the stages and the minimum and maximum values at or close to -4 and 4 respectively for all stages indicates that the answers for individual teachers were spread across the stages. The minimum and maximum possible were -4 and 4 respectively.

Table 25: Summary of distribution of scores for the teachers' stages of concern assessment

Stages of Concern	Mean	Median	Mode	Min	Max
Stage 0: Awareness	-0.465	0	0	-4	4
Stage 1: Informational	0.280	0	1	-3	3
Stage 2: Personal	-0.390	0	0	-3	4
Stage 3: Management	-0.375	0	-1	-4	4
Stage 4: Consequence	-0.045	0	0	-4	4
Stage 5: Collaboration	0.620	1	1	-4	4
Stage 6: Refocusing	0.375	0	0	-3	4

Table 26 lists the percentage of times that a stage had the maximum or minimum score for a particular respondent. The percentages do not sum to 1 because a tie score was possible. The spread in percentages across all the stages show that the sample of teachers exhibited wide differences in their concerns.

Table 26: Percentage that each stage received the maximum or minimum score by a respondent

Stages of Concern	Percent Max	Percent Min
Stage 0: Awareness	20%	37%
Stage 1: Informational	25%	15%
Stage 2: Personal	85%	24%
Stage 3: Management	15%	24%
Stage 4: Consequence	12%	19%
Stage 5: Collaboration	34%	14%
Stage 6: Collaboration	21%	9%

ARCHETYPE ANALYSIS

Archetype teacher profiles

We performed archetypal analysis, which composes archetypal teacher responses from the data. An individual teacher is assigned a weight for each archetype corresponding to the similarity between the teacher's responses and the archetype responses. We identify one archetype with mixed constructivist and transmissive beliefs, favourable opinion for project, presentation, and open-ended assessment techniques, and concerns focusing on awareness of the technology and to a lesser degree information and management concerns about the IWB technology; a second archetype was identified with transmissive beliefs, favourable opinions for short answer and standardised test assessment, and stages of concern focused on information about IWBs; a third archetype was identified with strong constructivist beliefs, favourable opinions for project, presentation, and open-ended assessment techniques, and high level concerns focused on student consequence, professional collaboration, and refocusing the technology. The appendix contains a detailed description of the archetypes according to the belief, assessment, and stages of concern response items.

Method

We conducted archetypal analysis for the combination of the teacher beliefs questions, assessment technique questions, and the stages of concern questions. Archetypal analysis is a technique for classifying data cases (respondents) according to patterns in their responses. The approach works by finding "archetypes" within the data. An archetype is a specific profile of responses. Every respondent is described as a combination of the archetypes. You can think of the archetypes as the set of individuals that best collectively describe the boundary of the data set. You can think of a specific respondent as a mix of various different archetypes for example, 80% archetype 1, 15% archetype 2, and 5% archetype 3. The higher the percentage allocated to a specific archetype, the more similar that respondent is to the specific archetype.

We chose to consider three archetypes after examining various model fitting measures. The more archetypes the better explained each individual but the more difficult to interpret the contrasts in the archetypes. The number of archetypes is therefore a subjective decision based on weighing the improvement in data fit against the complexity of an interpretation of the additional archetype.

ARCHETYPE TEACHER PROFILE DESCRIPTIONS

On average teachers gave favourable responses regarding their use of and attitudes towards IWBs. However, when teachers did have a negative opinion towards IWBs they were more likely to have heavier weighting on archetype 1 or 2 rather than archetype 3. Increased weight for Archetype 3 corresponds with preference for using the IWB, support for positive aspects of IWBs, the belief that the technology aides student learning, and that the IWB technology is useful for managing the class and classroom preparation.

Weight on archetypes 1 and 2 corresponds with lower access to IWBs and corresponding lower use of IWBs. Individuals with increased weight for archetype 1 appear to share common teaching beliefs but are a mix of IWB users and those without access to IWBs. Those in archetype 1 with access to IWBs generally have the opposite proportion of agree/disagree answers with regard to IWB attitudes and use behaviour as those with increased weight on archetype 3.

Those with weight on archetype 2 hold transmissive beliefs about teaching. Their opinions and usage patterns concerning IWBs are similar to archetype 1. They have lower use of IWBs, but their opinions about the benefits and disadvantages of IWBs are less pronounced than for archetype 1. Teachers with heavy weight on archetype 2 have a teaching approach that includes transmissive beliefs and teaching activities without the IWB. than the sample average of 69%.

Table 27 highlights the differences observed in teacher responses weighted by the archetypes. The left column indicates a demographic, behaviour, or belief characteristic from the survey not including those used to construct the archetypes. The middle three columns indicate the response trend associated with the particular archetype, and the right column indicates the mean response for this characteristic from the survey. The teacher characteristics are listed from top to bottom according to the strength of the relationship between differences in the characteristic and the archetypes.

Teachers who indicated they taught generalist primary were more likely to be associated with Archetype 3 as were teachers with the IWB in their room. Archetype 3 leaning teachers were more likely than the other teachers to use the IWB as a starter activity or throughout the whole lesson, and these teachers rated themselves as more proficient with the technology.

As an example to aid interpretation of Table 27, consider the first item "Use an IWB as part of lesson." Archetype 1 and 2 list "Never or Rarely." This means that teachers similar to Archetype 1 or Archetype 2 are more likely than the sample averages of 25% and 29%, respectively, to never or rarely use an IWB. By contrast teachers similar with Archetype 3 are more likely to use an IWB as a starter activity or throughout the whole lesson than the sample averages of 26% and 20%, respectively. The second item, "Because it helps students learn more," is an agree/disagree response. The table tells us that teachers similar to Archetype 1 and 2 are more likely to disagree with this statement than the sample average of 31% and teachers similar to Archetype 3 are more likely to agree with this statement than the sample average of 69%.

Table 27: Archetype profile descriptions indicating the response trend away from the sample mean for each archetype

Survey item	Archetype 1	Archetype 2	Archetype 3	Sample mean	
U1. Use an IWB as part of lesson	Never use Rarely	Never Use Rarely	Primarily as starter Throughout whole lesson	Never use Rarely As starter Whole lesson	25% 29% 26% 20%
U12_3 because it helps students learn more	Disagree	Disagree	Agree	Agree Disagree	69% 31%
Access to IWB	No access	Can book No access	In room	In room Can book No access	43% 35% 22%
U15_13 Changing my lesson plans to incorporate the new technology would take more time than I have	Agree	Agree	Disagree	Agree Disagree	38% 62%
U14_4 My class is more interactive now that we have an IWB	Disagree	average	Agree	Agree Disagree	65% 35%
U15_5 I am always looking for new ways for students to interact with the technology	Disagree	Disagree	Agree	Agree Disagree	82% 18%
U6_6 it improves student learning	Disagree	average	Agree	Agree Disagree	81% 19%
U12_5 because it helps me to be more organized	Disagree	average	Agree	Agree Disagree	60% 40%
U12_7 because the students enjoy the lessons more	Disagree	Disagree	Agree	Agree Disagree	73% 27%
U14_5 Students share more ideas and ask more question now that we have an IWB	Disagree	average	Agree	Agree Disagree	54% 46%
U8_4 During classroom discussions	No	No	Yes	Yes No	68% 32%
U12_2 when I find resources others have created	No	No	Yes	Yes No	68% 31%
U13_4 the IWB gets in the way of other things I want to do	Agree	Agree	Disagree	Agree Disagree	26% 74%
U15_10 I don’t really see a need for this technology	Agree	Agree	Disagree	Agree Disagree	13% 87%
U13_1 a significant inconvenience to redo my lesson plans for use with an IWB	Agree	Agree	Disagree	Agree Disagree	40% 60%
Generalist primary	No	No	Yes	Yes No	49% 51%
U5_5 use on IWB – Games	No	No	Yes	Yes No	56% 44%
IWB proficiency	Introductory	average but less likely Advanced	Intermediate Advanced	Introductory Intermediate Advanced	56% 34% 10%
U10_1 I can adapt lesson plans from others	No	average	Yes	Yes No	77% 23%
U15_6 An IWB is a regular feature in my classroom	Disagree	Disagree	Agree	Agree Disagree	39% 61%
U6_2 the students expect it	Disagree	average	Agree	Agree Disagree	51% 49%
U15_9 I would prefer to use a regular whiteboard	Agree	Agree	Disagree	Agree Disagree	28% 72%
Challenge naming and saving files	Yes	average	No	Yes No	28% 72%
U8_2 with the class or groups of students gathered close around the board	Disagree	Disagree	Agree	Agree Disagree	56% 44%
U15_3 The more students use the IWB the better	Disagree	average	Agree	Agree Disagree	63% 37%

CHAPTER 5 PHASE TWO: RICH TASK CHOICE EXPERIMENT

SUMMARY

In phase two, we conducted a survey of 268 Australian primary school teachers. The centrepiece of the survey was a discrete choice experiment that asked teachers to make hypothetical choices between pairs of lesson plans in response to four questions. The questions were:

1. Which lesson plan they would choose to deliver?
2. Which lesson plan would be easiest to prepare?
3. Which lesson plan would improve student learning outcomes the most?
4. Which lesson plan would the students enjoy more?

The lesson plans were targeted at developing the mathematical concept of Area with year 5 students. The sample topic is part of the Stage 3 mathematics curriculum in NSW and was chosen for its suitability for teaching in very diverse ways. We identified 6 attributes of rich tasks to inform the development of the lesson plans. Each lesson plan was characterized by one of two attribute levels (high or low) for the 6 attributes relating to “rich tasks”. Additionally, each lesson plan included the use of either the IWB or the use of a desk activity with physical materials. A particular choice situation might present two IWB lesson plans, two desk lesson plans, or one IWB and one desk lesson plan.

The teachers showed an almost equal preference for lessons using IWBs and lessons using physical materials. The findings also suggest that primary school teachers prefer lesson plans where the children work in groups, the teacher designs the test, and the children use a variety of instruments and materials.

While the teachers individually exhibited strong preferences between lesson plans, most teachers found that most of the presented lesson plans described acceptable ways to teach the topic. This indicates that on a day-to-day basis there are likely to be many factors outside of preference for a lesson plan’s specific characteristics that influence a teacher’s lesson plan design. We investigated three potential factors, with three additional questions asking about ease of preparation of lesson plans, increased student learning, or increased student enjoyment. Other factors might also be relevant, for example, resource limitations, institutional pressures, previous preparation for similar topics, and familiarity with the technology.

Teachers did indeed answer the four questions differently from each other for particular lesson plans. For example most teachers preferred to design the test themselves, however, they recognized that having the students design the test would be easier to prepare. Similarly, most teachers preferred group activities, however, most did not feel that a group activity would be easier or more difficult to prepare than an individual activity.

While teachers’ assessments of lesson plans differed across the four questions, there were even larger differences between the teachers themselves in how they answered each question. For example, while a majority of teachers felt that students would learn more when the students generated questions regarding the task, another large group of teachers felt that students would

learn more when teachers provided directions on what to do. Teachers exhibited the most agreement when it came to the lesson plans that students would enjoy the most.

Taken as a pilot study, the survey results indicate promise for studying teachers' choice behaviour with respect to teaching and technology.

Survey description

The survey was administered using the PureProfile online panel. Respondents were screened to eliminate all but those who were Australian primary school teachers. A total of 268 respondents completed the survey. A total of 63 respondents did not complete the survey representing a non-response rate of 18%. We had anticipated being able to collect 400 responses, but the panel provider was unable to deliver the additional respondents.

The central element of the survey was a discrete choice experiment where the teachers made hypothetical choices between alternative lesson plans intended to develop the concept of area for students in year 5.

The survey consisted of five parts listed here in the order they were presented to respondents. Screen shots from the survey are found in the Appendix.

1. The initial screening and demographics questions
2. A discrete choice experiment where each respondent considered eight pairs of lesson plans. The respondent chose the lesson she would choose to deliver and then also indicated if the chosen lesson would be a satisfactory way to teach
3. Additional demographic questions including questions about the teacher's school and career intentions
4. A discrete choice experiment where each respondent considers eight pairs of lesson plans. The respondent makes three choices for each pair of lesson plans corresponding to which lesson plan would
    a. Be easiest to prepare
    b. The students enjoy the most
    c. Have the best student learning outcomes
5. Additional questions about a teacher's experience and perceptions of teaching, particularly using IWBs. These questions were replicated from questions from the previous survey (see Chapter 4).

Each of the lesson plan attributes used in the discrete choice experiment (Collaboration, Assessment, Resources, Task, Directions, Followup) was intended to capture one of the relevant dimensions of a rich task. Table 28 lists the high and low level elaborations that were established for each attribute with the high level (level 2) representing a rich task.

Table 28: The attributes and levels that describe each lesson plan presented in the discrete choice experiment

CHOICE TASK ONE: WHICH LESSON WILL YOU DELIVER?

In the next week, you will be running a lesson in mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on what you are more likely to do:

Set 1 of 8

Features	Lesson A	Lesson B
TASK:	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas
DIRECTIONS:	**You** will **provide** a sequence of **steps** to guide students through the activity	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work individually**	Students will **work in groups**
RESOURCES:	Students will use only **a few measuring instruments and materials** to complete task	Students will use only **a few measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **cardboard shapes on a desk**	Students will consider various areas in the form of **cardboard shapes on a desk**
ASSESSMENT:	**Students design** their own **test** to complete	**You** will **prepare** a **test** for students to complete
FOLLOW UP:	Students will present a report **reflecting on** the **process used and possible improvements**	Students will present a report **reflecting on** the **process used and possible improvements**
Which of the two lessons are you most likely to deliver to your students?	◯Lesson A	◯Lesson B

Thinking realistically about your most preferred lesson plan you just chose, if you had to deliver this lesson would you find this a satisfactory way to do it?

◯Yes, this would be satisfactory

◯No, this would be unsatisfactory

Set 2 of 8

Features	Lesson A	Lesson B
TASK:	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas
DIRECTIONS:	**You** will **provide** a sequence of **steps** to guide students through the activity	**You** will **provide** a sequence of **steps** to guide students through the activity
COLLABORATION:	Students will **work in groups**	Students will **work individually**
RESOURCES:	Students will combine their learning with **a variety of measuring instruments and materials** to complete task	Students will combine their learning with **a variety of measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **shapes** on the **Interactive White Board**	Students will consider various areas in the form of **cardboard shapes on a desk**
ASSESSMENT:	**You** will **prepare** a **test** for students to complete	**You** will **prepare** a **test** for students to complete
FOLLOW UP:	Students will present a report **reflecting on** the **process used and possible improvements**	Students will present a report **describing what they** have **found**
Which of the two lessons are you most likely to deliver to your students?	◯Lesson A	◯Lesson B

Thinking realistically about your most preferred lesson plan you just chose, if you had to deliver this lesson would you find this a satisfactory way to do it?

◯Yes, this would be satisfactory

◯No, this would be unsatisfactory

Set 3 of 8

Features	Lesson A	Lesson B
TASK:	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas
DIRECTIONS:	**Students** will **generate** their **own questions** to investigate things they need to find out	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work individually**	Students will **work individually**
RESOURCES:	Students will combine their learning with **a variety of measuring instruments and materials** to complete task	Students will combine their learning with **a variety of measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **cardboard shapes on a desk**	Students will consider various areas in the form of **cardboard shapes on a desk**
ASSESSMENT:	**You** will **prepare** a **test** for students to complete	**Students design** their own **test** to complete
FOLLOW UP:	Students will present a report **describing what** they have **found**	Students will present a report **reflecting on** the **process used and possible improvements**

Which of the two lessons are you most likely to deliver to your students? ◯Lesson A ◯Lesson B

Thinking realistically about your most preferred lesson plan you just chose, if you had to deliver this lesson would you find this a satisfactory way to do it?

◯Yes, this would be satisfactory

◯No, this would be unsatisfactory

SUMMARY STATISTICS

The summary statistics related to the sample population of teachers are reported here without discussion. Respondents indicated they were teachers and then subsequently indicated that they were primary school teachers in order to qualify for the survey.

DEMOGRAPHICS

Gender

	Frequency	Percent
Male	31	11.6
Female	237	88.4

Age

	Frequency	Percent
18-24 years	15	5.6
25-29 years	53	19.8
30-34 years	51	19
35-39 years	39	14.6
40-44 years	24	9
45-49 years	18	6.7
50-54 years	29	10.8
55-59 years	25	9.3
60-64 years	10	3.7
65-69 years	2	0.7
70 years and over	2	0.7

State		
	Frequency	Percent
NSW	86	32.1
VIC	81	30.2
QLD	50	18.7
SA	13	4.9
WA	26	9.7
ACT	7	2.6
TAS	2	0.7
NT	3	1.1

What is the main type of internet connection that you have at home?			
	Frequency	Percent	Cumulative Percent
Mobile Broadband	47	17.5	17.5
Broadband	210	78.4	95.9
Dial-up	1	0.4	96.3
Other type of internet connection	9	3.4	99.6
No internet connection	1	0.4	100

TEACHING RELATED STATISTICS

What years do you presently teach?		
	Frequency	Percent
K-3	208	77.6
4-6	153	57.1

What is your current work status?		
	Frequency	Percent
I am a full-time teacher	148	55.2
I am a part-time teacher	115	42.9
I left the teaching profession less than 12 months ago	5	1.9

What is the highest non-school qualification you have?		
	Frequency	Percent
Postgraduate Degree or equivalent	53	19.8
Graduate Diploma or Graduate Certificate from university or equivalent	47	17.5
Bachelor Degree or equivalent	137	51.1
Diploma of teaching	27	10.1
None of the above	4	1.5

What are your plans for the future?		
	Frequency	Percent
I am planning to remain in the profession	233	86.9
I am considering leaving the profession due to family reasons (e.g., having a baby)	19	7.1
I am considering leaving the profession due to employment reasons (e.g., stress;	7	2.6
I am planning on leaving for reasons other than those above	9	3.4

In which type of school do you teach?		
	Frequency	Percent
State	183	68.3
Independent religious	30	11.2
Independent secular	22	8.2
Catholic systemic	33	12.3

How many students are enrolled in this school?		
	Frequency	Percent
25 or less students	6	2.2
26 to 112 students	34	12.7
113 to 159 students	11	4.1
160 to 240 students	25	9.3
241 to 300 students	17	6.3
301 to 420 students	47	17.5
421 to 450 students	16	6
451 to 515 students	33	12.3
516 to 700 students	34	12.7
701 to 1015 students	28	10.4
1016 to 1050 students	2	0.7
More than 1050 students	15	5.6

Do you have any students that you must attend to with considerable learning disabilities:		
	Frequency	Percent
Yes, it takes up the majority of my time	77	28.7
Yes, but it is one or a few students among many	152	56.7
No	39	14.6

Summary of behaviours and attitudes related to teaching and IWBs

This section reports the answers to various questions regarding teachers' experiences, behaviours, and attitudes towards IWBs. Sixty-two percent of teachers report they have an IWB in their classroom, and sixty-five percent of teachers agree that the IWB is a regular feature of their classroom. We use the response that teachers agree that the IWB is a regular feature in order to partition the data from the discrete choice experiment into regular IWB users and non-regular IWB users. That question is highly correlated with other questions regarding IWB use in this survey and in the previous survey.

It is also of note that a larger percentage of teachers indicate they are looking for ways for students to interact with IWBs, they use the IWBs because students enjoy the lessons more, and that students learn more with IWBs than the percentage of teachers that say that the IWB is a regular feature in their classroom. These results correspond with the results from the discrete choice experiment where we found that more teachers preferred use of the IWB to improve student learning outcomes, for student enjoyment and for easy preparation than chose the IWB for the lesson plans that they would deliver. This invites a question about why there seems to be comparatively less use of IWBs for lesson planning, considering how many teachers said that IWB use would increase student learning, student enjoyment, and easy preparation.

Please select the location where you do the majority of your lesson preparation

	Frequency	Percent
School	63	23.5
Home	106	39.6
About evenly split between school and home	99	36.9
Total	268	100

My access to an IWB is best described by...

	Frequency	Percent
An IWB is in my classroom	166	61.9
An IWB can be brought in if I book it	19	7.1
I can use an IWB if I book the classroom where it is installed	37	13.8
I don't have access to an IWB	39	14.6
I have never seen an IWB used	7	2.6

I would characterise my experience with IWBs as

	Frequency	Percent
Introductory	80	29.9
Intermediate	127	47.4
Advanced	41	15.3
None	20	7.5

Attitudes and preferences regarding IWBs		
	Agree	Disagree
I am always looking for new ways for students to interact with the technology	85	15
I use IWBs because the students enjoy the lessons more	84	16
In terms of using the IWB, I can adapt lesson plans from others	81	19
I use IWBs because it helps students learn more	74	26
I use IWBs because it improves student learning	73	27
My class is more interactive now that we have an IWB	66	34
An IWB is a regular feature in my classroom	65	35
I tend to use IWBs more when I find resources other have created	63	37
I generally use an IWB as part of my lessons	62	38
I use IWBs during classroom discussions	62	38
Students share more ideas and ask more questions now that we have an IWB	62	38
I use IWBs because it helps me to be more organized	53	47
Changing my lesson plans to incorporate the new technology would take more time than I have	35	65
I use IWBs because students expect it	33	67
I would prefer to use a regular whiteboard	21	79
It is a significant inconvenience to redo my lesson plans for use with an IWB	19	81
The IWB gets in the way of other things I want to do	15	85
I don't really see a need for IWBs	9	91

I frequently use the following applications or tools on the IWB		
	Yes	No
Games and other activities made possible by board	77	23
Connection to Internet	77	23
As a whiteboard for drawing, notes, etc.	77	24
Prepared lessons	71	29
Smart resources	66	34
Microsoft PowerPoint	65	35
Video playback	63	37
Smart Notebook	44	56
Other	34	66
Video conferencing	9	91

Challenges I experience with the IWB are		
	Yes	No
Only able to have one person use the IWB at a time	59	41
Writing notes on the IWB	38	62
Getting access to an IWB because it is in a shared room or is shared between rooms	31	69
Naming, saving, and organising files	25	75

Discrete choice experiment results

Each of the six lesson plan attributes could take on one of two levels, as presented in Table 2. The different levels that each attribute could take were either aligned or misaligned with the concept of a rich task. A seventh attribute either labelled the lesson plan with an IWB activity or a desk and physical materials activity.

In the first set of 8 choices we asked the teachers whether their choice would be acceptable. The large majority (83%) of the lesson plans chosen as most preferred was also deemed by teachers to show acceptable ways to teach the topic. This result seems to indicate that while teachers expressed strong opinions about which lesson plans were most preferred, there is considerable latitude between an ideal lesson plan and an acceptable lesson plan. Ideal lesson plan means the one that had the level of each attributes that they valued the most. Since there were two levels for each attribute then it is relatively easy to see which was the ideal "profile for a lesson plan" based on the highest scoring level for each attribute. We conjecture that for any particular lesson plan there are likely to be numerous factors that influence the design of a lesson plan and that different factors would hold different weight in the decision process depending on the specific context of that lesson.

Teacher choice

Teachers preferred the rich task levels for all attributes with the exception of Assessment for both media (IWB and desk/physical materials) and Directions for the IWB medium. Table 29 indicates the attribute levels that were *most preferred* for both an IWB lesson and a desk lesson.

Table 30 indicates the attribute levels that were *least preferred* for both an IWB lesson and a desk lesson. These lesson profiles can be thought of as the average most and least preferred lesson plans from all possible combinations of lesson plans. The grey italics in the tables indicate that a particular level was not significant at a 95% confidence interval.

Table 29: Profile of most preferred lesson plan using the IWB or using student desks and physical materials according to the sample averages

	IWB	Desk
Task	Work out how many stalls you can have at your school fete by calculating stall and playground areas	*Work out how many stalls you can have at your school fete by calculating stall and playground areas*
Directions	*You will provide a sequence of steps to guide students through the activity*	Students will generate their own questions to investigate things they need to find
Collaboration	Students will work in groups	Students will work in groups
Resources	Students will combine their learning with a variety of measuring instruments and…	Students will combine their learning with a variety of measuring instruments and…
Assessment	You will prepare a test for students to complete	You will prepare a test for students to complete
Followup	*Students will present a report reflecting on the process used and possible improvements*	*Students will present a report reflecting on the process used and possible improvements*

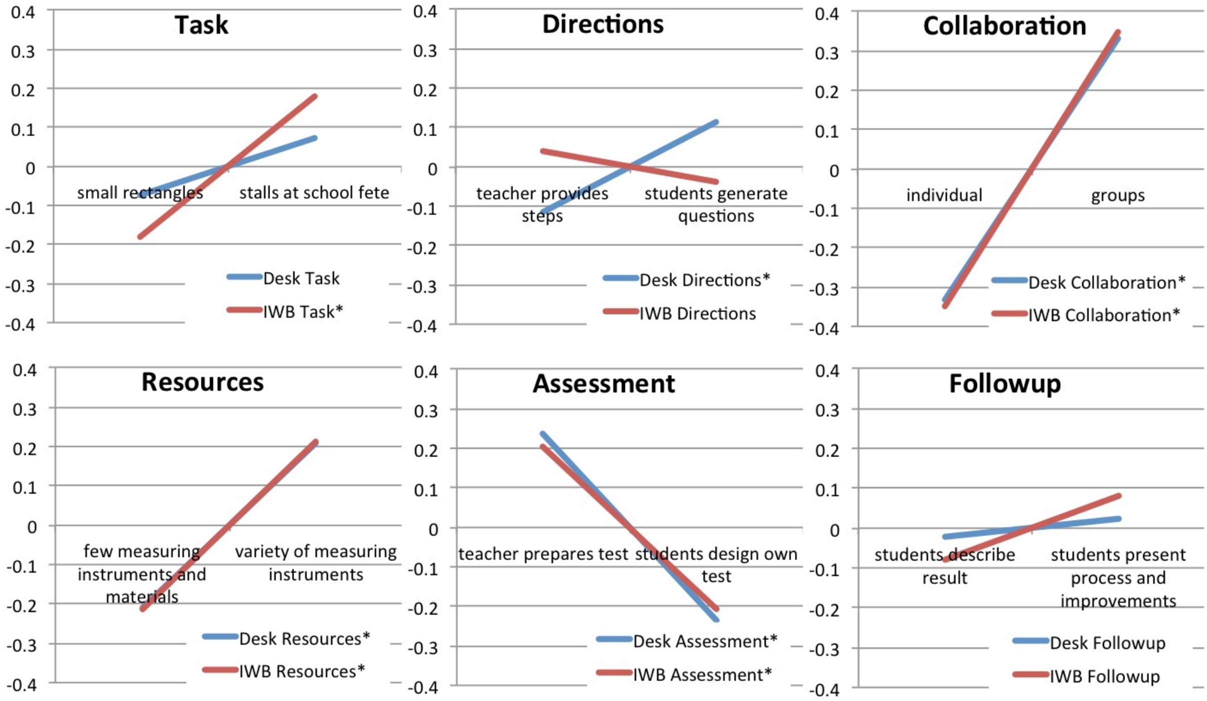
*Items listed in grey italic font were not significantly different at 95% confidence than the alternative level.

Table 30: Profile of least preferred lesson plan using the IWB or using student desks and physical materials according to the sample averages

	IWB	Desk
Task	Predict the number of small rectangles that will fit in a large shape by calculating…	*Predict the number of small rectangles that will fit in a large shape by calculating…*
Directions	*Students will generate their own questions to investigate things they need to find*	You will provide a sequence of steps to guide students through the activity
Collaboration	Students will work individually	Students will work individually
Resources	Students will use only a few measuring instruments and materials to …	Students will use only a few measuring instruments and materials to …
Assessment	Students design their own test to complete	Students design their own test to complete
Followup	*Students will present a report describing what they have found*	*Students will present a report describing what they have found*

*Items listed in grey italic font were not significantly different at 95% confidence than the alternative level.

Figure 4 shows Preferred and Not Preferred levels for each lesson plan attribute according to medium type for the question of which lesson plan the teacher would actually deliver. On average teachers prefer lesson plans where students generate the questions rather than teachers providing directions when the lesson involves a desk activity with physical materials compared with a slight preference for teacher directions for IWB activities. The other preferences are similar for IWB or desk activities.

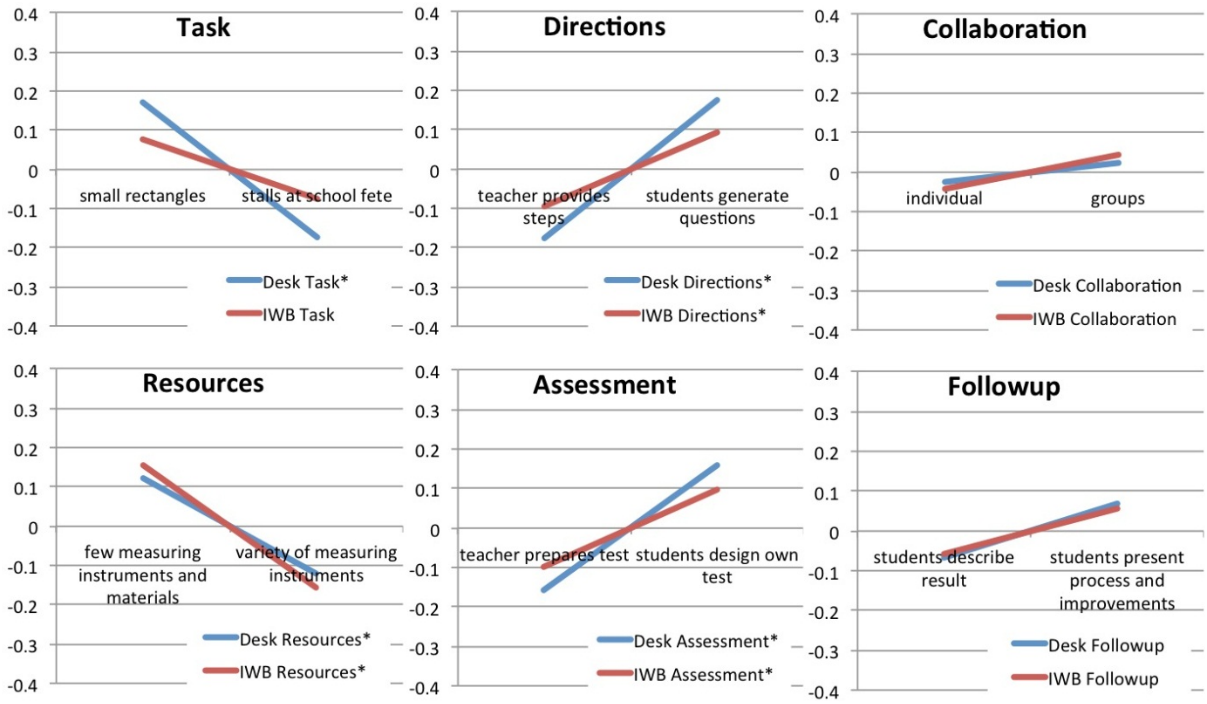


* Indicates that the attribute level is statistically significant with a 95% confidence.

Figure 4: Plots for each attribute for each technology showing the average relative importance of the attribute levels on teachers' choice of lesson to deliver

EASY PREPARATION

Figure 5 shows Preferred and Not Preferred levels for each lesson plan attribute according to medium type for the question of which lesson plan would be easiest to prepare. Teachers agree on average with the relative importance of each attribute level for both IWB and desk activities in determining which lesson plans will be easiest to prepare. In other words, this demonstrates that independent of media, the teachers agreed about which level of the other attributes would make the lesson easier to prepare.

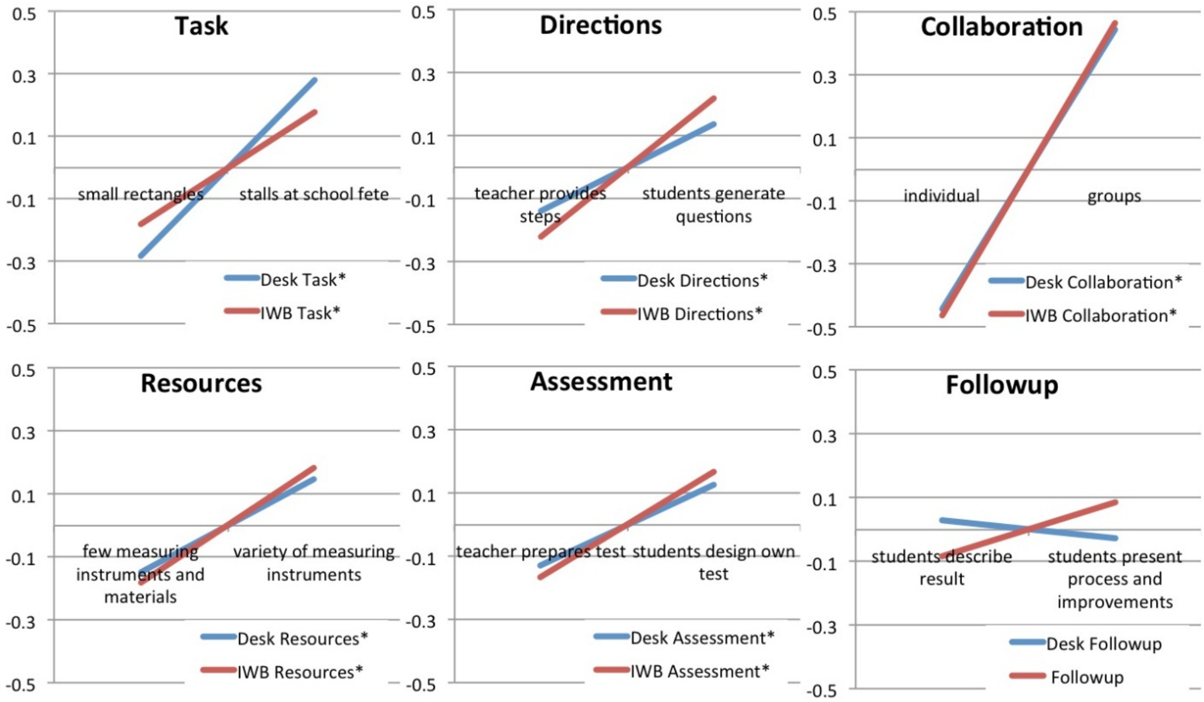


* Indicates that the attribute level is statistically significant with a 95% confidence.

Figure 5: Plots for each attribute for each technology showing the average relative importance of the attribute levels on teachers' choice of easiest lesson to prepare

STUDENT ENJOYMENT OF LESSONS

Figure 6 shows Preferred and Not Preferred levels for each lesson plan attribute according to type of medium, for the question of which lesson plan would students enjoy more. Teachers agree on average about the relative importance of each attribute level for both IWB and desk activities for this question with the exception of the Follow-up attribute levels, where they disagree. However, the differences in Follow-up are not statistically significant.

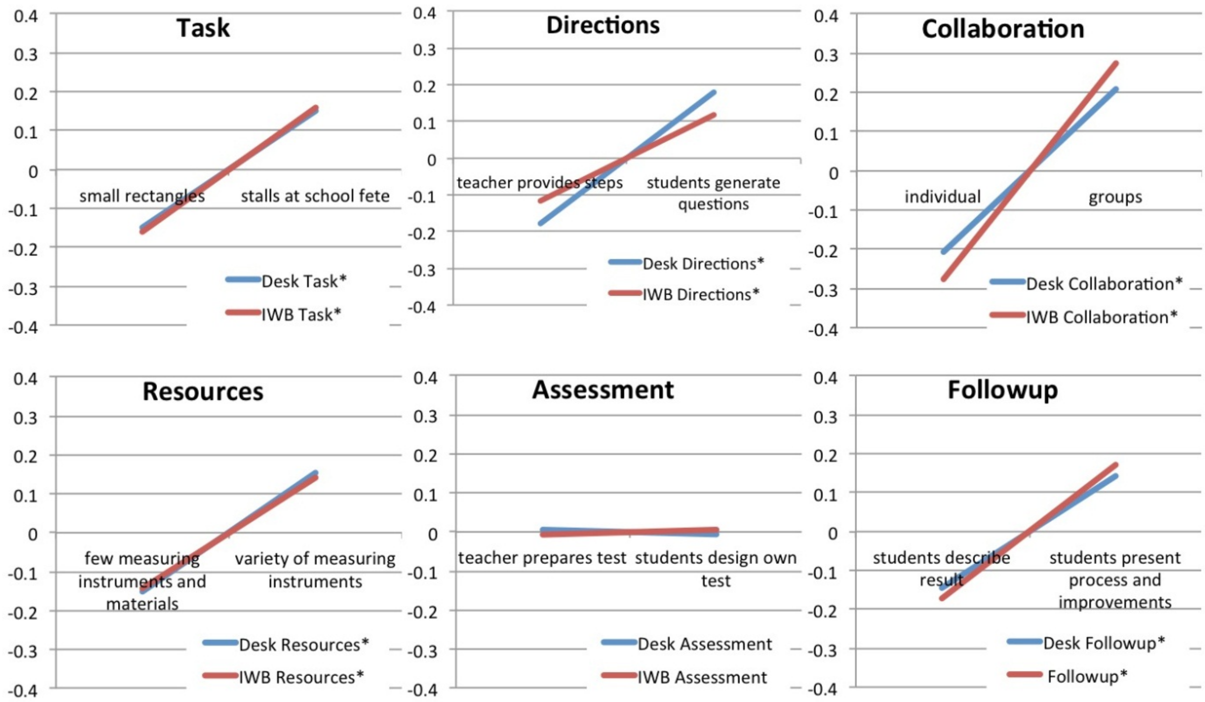


* Indicates that the attribute level is statistically significant with a 95% confidence.

Figure 6: Plots for each attribute for each technology showing the average relative importance of the attribute levels on teachers' choice of lesson students will enjoy most

STUDENT LEARNING OUTCOMES

Figure 7 shows Preferred and Not Preferred levels for each lesson plan attribute according to medium type for the question of which lesson plan would most improve student learning outcomes. Teachers agree on average about the relative importance of attribute levels for both IWB and desk activities. On average teachers believe that the type of assessment used has no influence on student learning outcomes.



* Indicates that the attribute level is statistically significant with a 95% confidence.

Figure 7: Plots for each attribute for each technology showing the average relative importance of the attribute levels on teachers' choice of lesson that will most improve student learning outcomes

ANALYSIS BY TEACHER SEGMENT

We reanalysed the data considering each teacher segment (regular or non-regular IWB users) and each lesson plan medium separately for each segment. This approach allows us to examine differences among teachers and differences according to medium types. Table 31 highlights the attribute levels that were most important and had a large effect for each combination of teacher segment and lesson plan medium. Additionally,

Figure 9, in the appendix, provides more detailed comparison by segment. We discuss each of the four discrete choice experiment questions in turn.

TEACHER CHOICE

The nature of the task (rectangles or school fete) is not important for non-regular IWB users when they have a desk activity, but it is important for the other groups (ie non-regular IWB users with IWB activity and regular IWB users with both desk and IWB activities).

Both types of teachers prefer for students to generate their own questions for the desk activity, whereas they are evenly split when it comes to the IWB activity.

Both types of teachers are evenly split about the best way to follow-up with students when a desk activity is used. However, when an IWB activity is used, regular IWB users strongly prefer for students to present the process they used and possible improvements whereas non-regular IWB users prefer students to simply describe the results.

Easy preparation

Regular IWB users considering what makes a lesson easy to prepare when it involves an IWB have the least consistent preferences of any of the groups for any of the questions. The primary factor in determining if the lesson is easy to prepare is whether it involves an IWB or not. The other attribute levels are not perceived as having a dramatic effect on IWB lesson preparation. This trend is reversed for non-regular IWB users when they consider IWB lesson preparation. That group has strong preferences about what makes an IWB lesson easy to prepare including using few instruments, using the small rectangle rather than the school fete task, having students design their own test and generate their own questions. Each teacher group may simply be better at planning their lesson using their preferred medium. Non-regular IWB users identified group activity as facilitating easy lesson preparation for desk activities—perhaps because of less physical kits of materials to prepare—while regular IWB users did not associate group activity with ease of preparation for desk activities.

Student enjoyment of lessons

Both groups of teachers responded the most consistently to this question on student enjoyment relative to the consistency in the responses to the other three questions. One difference is that for the desk activity the regular IWB users indicated that using a variety of instruments (i.e., student interaction with technology) was important for student enjoyment whereas the non-regular IWB users indicated that students generating their own questions (i.e., students' interaction with teacher and other students) was more important for student enjoyment.

Student learning outcomes

Regular IWB users prioritize group work as the most important factor leading to improved student learning outcomes. Non-regular IWB users also prioritise groups highly for IWB lesson plans, but they prioritise group work less highly for desk activities. Somewhat opposite to the priorities for student enjoyment, non-regular IWB users put more importance on students using a variety of instruments and less importance on working in groups whereas regular IWB users put less emphasis on using a variety of materials, especially for IWB activities.

Table 31: Lesson plan attributes in order of importance for each segment (Regular IWB users or Not regular IWB users) and medium choice (IWB or Desk and cardboard). Attributes are included in the table if they achieved at least 60% incidence in the preferred lesson plans for each discrete choice experiment question

Segment	Regular IWB users	Not Regular IWB users	Regular IWB users	Not Regular IWB users
Medium	IWB	IWB	Desk	Desk
Teacher choice	1. Groups 2. Students present process 3. Variety of instruments 4. Stalls at school fete	1. Groups 2. Teacher prepares test 3. Stalls at school fete 4. Variety of instruments	1. Groups 2. Variety of instruments 3. Teacher prepares test 4. Stalls at school fete	1. Groups 2. Teacher prepares test 3. Variety of instruments 4. Students gen. questions
Easy prep	1. Few instruments	1. Few instruments 2. Small rectangles 3. Students design own test 4. Students gen. questions 5. Students present process	1. Students design own test 2. Students gen. questions	1. Few instruments 2. Small rectangles 3. Students gen. questions 4. Groups
Students enjoy	1. Groups 2. Students gen. questions 3. Stalls at school fete 4. Variety of instruments 5. Students design own test	1. Groups 2. Students gen. questions 3. Stalls at school fete 4. Variety of instruments 5. Students design own test 6. Students present process	1. Groups 2. Stalls at school fete 3. Variety of instruments	1. Groups 2. Stalls at school fete 3. Students gen. questions
Students learn	1. Groups 2. Stalls at a school fete 3. Students present process 4. Students gen. questions	1. Variety of Instruments 2. Groups 3. Students present process	1. Groups 2. Variety of instruments 3. Students gen. questions 4. Stalls at school fete	1. Variety of instruments 2. Stalls at school fete 3. Students present process 4. Groups 5. Students gen. questions

Attribute levels highlighted in blue are more associated with "rich tasks" compared to those attribute levels highlighted in red

CHAPTER 6 CONCLUSION (AND IDENTIFICATION OF FURTHER RESEARCH)

FINDINGS FROM PHASE ONE

In the first phase of the study, on which this document reports, there were two data collection methods, one using a qualitative research paradigm, and the other using a quantitative paradigm. As well as enhancing the integrity of our findings, this mixed-mode methodology is a distinctive feature of this study and distinguishes it from other typically qualitative studies in this area. The first method comprised focus groups with teachers and Electroboard staff on teacher use of IWBs, their reasons for so doing and the facilitating factors and impedances. The data from the focus groups were primarily used to develop the second method, comprising a survey using agree/disagree statements, ranking, and best-worst scaling. The survey instrument was sent to teachers and the results analysed to consider links between beliefs about teaching approaches, concerns with adoption of technologies, and decisions about IWB use. From the results of the survey, archetypal profiles of teachers were developed.

DISCUSSION OF FINDINGS FROM FOCUS GROUPS

The findings from the focus groups are discussed below. We note those findings that differ from earlier ones in the study conducted by Schuck and Kearney (2007) with Electroboard in 2005-2007.

In general, the focus group data pointed to differences in IWB usage between high schools and primary schools. Primary schools appeared to use IWBs more frequently and in more diverse ways than high schools, where access did not seem as high and usage tended to be more presentational. Further, there were noted differences in patterns of use, according to which stage teachers were teaching. Early primary school or stage 1 usage differed markedly from stage 3 or senior primary usage, both in nature and frequency. One area that was not stage-dependent, however, was the mode of IWB use; they were found to be used more frequently for whole class usage across all levels of school.

Access to IWBs was seen as an important factor and not surprisingly, the more access and experience teachers had with IWBs, the more innovative the usage was. This finding is related to another finding which indicated that more confident teachers used the IWBs more frequently. The data indicated that for some teachers in secondary schools, better access to the IWBs was needed.

School-based and external professional learning options for teachers to learn to use the IWBs appear to have increased greatly since the 2007 study. Sharing experiences with colleagues and their peer support was an important factor. This was happening through both face-to-face communications and also through school intranets. User groups were also useful for professional learning. There appeared to be more opportunities to network with other users and seek their support through online professional learning communities. These formal and informal professional development opportunities appear to have developed in recent years in response to some of the external push-pull dynamics discussed in Chapter 3. However, teachers did express a need to further tailor more formalised professional development sessions such as in-services to individual stages of development.

IWBs were used initially for a number of reasons. One was pressure from others to use them, including pressure from principals, colleagues and students. Thus there is a push-pull dynamic with a push for IWB use from employers, principals and executive as well as a pull from students and parents expecting or wanting them due to their perceived educational benefits. A third reason explaining their adoption by some teachers was a perceived match between the IWB as tool and the teachers' pedagogical styles. Many teachers used the IWBs because of their affordances: they were suitable for providing 'just-in-time', spontaneous internet access during lessons, an attractive visual mode of presentation, and appropriate software supporting relevant activities across the K-12 curriculum. IWBs were also considered supportive of teachers' file management, lesson planning and capture as well as providing opportunities for reflection on lessons.

In general, there was a belief that IWBs are useful pedagogical tools.

An ongoing issue raised in the last report was the varying perceptions of interactivity. When teachers were asked about the IWB affordances, they often mentioned interactivity as one of the features. When pressed on this statement, teachers explained that they were discussing interaction between the technology and the user rather than peer and/or teacher-student interactions as understood in other literature about interactivity. It appears that interactivity has different meanings dependent on the context of use.

The study found that teachers were using IWBs more often to leverage serendipitous moments during lessons. For example, spontaneous access to useful sites through the IWBs occurred and teachers were able to capitalise on these teaching moments more readily than indicated in the previous study.

Finally, teachers described a number of interesting examples of usage of the IWB. While many of these examples (such as use of blog facilities) demonstrated student-centric pedagogies, the central feature of these activities was typically other learning technologies. Essentially, the IWB was being used to mediate whole-class discussions about these activities. In this way, the contribution of the IWB appeared to be in promoting these activities by providing efficiency and access in the classroom.

DISCUSSION OF FINDINGS FROM FIRST SURVEY

The survey had three sections that were adapted from existing literature. The items in these three sections were designed to assess teachers' beliefs about teaching and learning, opinions about assessment techniques, and perceptions of IWB as a teaching innovation. The data were analysed for relationships between these constructs and other characteristics such as use, access and demographics. An archetypal analysis was done on the data: this analysis identified people representing the extreme points in the data. It considered the three most different types of people in the group of respondents. The analysis then looked for relations between these three archetypes and the other respondents in the sample.

Survey data revealed noticeable differences between primary and secondary teachers' experiences with IWBs. Most primary school teachers had access to a IWB while many secondary teachers noted some constraints regarding convenient access to an IWB (e.g. use of a booking system; IWB shared between rooms). Primary school teachers were more likely to have had satisfactory levels of training and a higher percentage of primary teachers perceived themselves as intermediate or advanced users. Primary teachers used a wider range of applications; for example, they are far more likely to use games or the range of existing software. Primary teachers were more likely to use an IWB during class discussions or during small group exercises. Primary teachers generally had more positive experiences with the IWB and subsequently expressed more favourable views relating to the potential for IWBs to enhance learning and support lesson planning and organisation.

Almost all teachers held a strong view that it was important to use contemporary technologies in their classrooms and sharing and re-use of lessons was also a strong reason for them to initially use the IWB. The large majority of teachers (approx. 90%) perceived the IWB as enabling new ways of teaching and learning in their classrooms. A strong finding (86%) was that most teachers expressed a desire for more professional development with IWBs.

The three archetypes can be identified as follows:

Archetype 1 represents the teacher who does not have access to IWBs or is trying to learn to use them, or has access but does not believe the IWB is useful for their teaching. Views about teaching are a mixture of constructivist and transmissive beliefs.

Archetype 2 appeared to be at the stage of concern, using the Concerns Based Adoption Model (CBAM), that indicated a need for information about the IWBs. Beliefs about teaching appeared to favour transmissive teaching. This archetype exhibits the same trends as archetype 1, may have mixed opinions about IWBs but trends are not as strong as for 1. IWBs do not appear to alter their teaching paradigm.

Archetype 3 was identified as having strong constructivist beliefs and also high level concerns which focused on student outcomes from IWB use. This archetype saw the IWB as changing their pedagogy for the better. They also see the system supporting them in their use.

Generally, when teachers had a negative opinion of IWBs they tended to align more with archetype 1 or 2 than with archetype 3. Archetype 3 tended to show support for use of IWBs, and to demonstrate a belief that the technology aids student learning. Another interesting finding from the survey is that age is not an important factor in differentiating between the archetypes, but teaching in high school or primary school is a significant factor. High school teachers tended to fit archetypes 1 and 2 where primary teachers tended to fall more into archetype 3.

Limitations of these findings are that the sample was moderate in size (n=200) so the findings at this stage are tentative. Indications are that valuable results will be gained from extending the sample in phase 2 of the study.

Phase two discrete choice experiment

Phase one of the study indicates that further research on the archetypes will be valuable. Another important focus of the study was rich pedagogies and how these incorporate use of IWBs and other technologies. In phase 2 of the study we built on the results from phase 1 and our understandings of rich tasks from the literature. We surveyed teachers who were currently teaching primary school classes about their use of rich tasks and different media in their lessons, through the development of a discrete choice experiment.

Discussion of findings from discrete choice experiment

The survey was conducted with primary school teachers. For the examples provided in the survey, the findings indicated that these teachers preferred to teach lessons where children work collaboratively, and varied resources are used, regardless of whether they used IWBs as the medium for task or not. They also showed a preference for teacher-directed assessment as a source of evidence of learning outcomes. This choice was despite beliefs that students would enjoy designing their own questions more and despite their belief that the latter would be easier to prepare.

When the medium is IWB, there is a significant preference shown for authenticity as a characteristic of the lesson.

Teachers expressed a slight preference for teacher-directed lessons when using IWBs despite indicating that they believed student-generated questions and enquiry were more likely to provide improved learning outcomes, greater student enjoyment and ease of preparation.

Although teachers preferred lesson plans that exhibited high levels of rich learning task characteristics, they found lesson plans without these characteristics to be quite acceptable. This indicates that there is a range of factors other than the lesson's specific characteristics which influence teachers' decisions. For example, a range of practical and contextual considerations influence the nature of lessons that teachers teach.

The findings indicated that teachers did not agree on one accepted way of improving student learning outcomes. However, there was agreement about those characteristics of rich tasks that would lead to greater student enjoyment.

The survey enabled segmentation of the respondents into regular IWB-users and non-regular IWB users. This analysis of each segment provided insights into preferences that were masked when looking at the whole group. When looking at these separately, a number of differences occurred. The primary finding from the segment-by-segment analysis is that the different teacher groups have notably different preferences, and these preferences also vary with the medium involved in the lesson.

Unsurprisingly, there were differences between regular and non-regular IWB users, in their perceptions regarding ease of use when planning and teaching lessons.

When an IWB activity is used, regular IWB users strongly prefer rich characteristics in student reporting of the task, including reflection on possible improvements. Regular IWB users favoured group work as the most important factor in improving student learning outcomes. Non-regular IWB users valued collaboration more highly when using the IWB than when they use desk lessons.

Studying individual teachers reveals that even within a teacher group, such as regular IWB users, a wide range of preferences are exhibited. These differences are worth studying in future studies. Another topic identified from the study that is worth considering in future studies is the idea that the perceived pedagogical and technological affordances of a particular medium may not align completely with all the characteristics of a rich task. Instead different media seem to be suited to different aspects of rich tasks. For example, the IWB may afford students developing reflective presentations rather than descriptive presentations as indicated by the importance of the reflective presentation follow-up in teacher choice for regular IWB users. On the other hand, the richness of a desk activity with physical materials may be enough to balance out using an abstract task such as counting squares, rather than a more authentic task such as calculating stalls for the school fete as indicated by the weak preference for the school fete activity in teacher choice with desk activities for non-regular whiteboard users. Also, the desk activity may be easier for the teachers to engage the students in generating their own questions rather than requiring teachers to provide instructions about what to do as indicated in the results for Ease of Preparation.

Different paths forward could include adapting a particular medium to better support more aspects of a rich task. For example, working in groups was seen as an advantage across almost every criterion (i.e., teacher choice, easy preparation, student enjoyment, student learning outcomes), and the IWB was the preferred technology for all criteria except teacher choice, where it was split evenly with the desk activity. Perhaps one of the reasons that teachers indicated that the IWB was preferred for the three teaching criteria assessed, but then did not choose an IWB lesson plan more frequently than a desk plan is because they realize that group work for the whole class is difficult with the IWB. Interactive tables would perhaps be a way to overcome this limitation while maintaining the positive aspects of IWBs.

An alternative approach for managing differences in media related to rich tasks would be to highlight aspects of a medium that teachers currently perceive as not well suited for particular aspects of rich tasks. Then, technology training can focus on helping teachers deliver the enabling aspects of rich tasks that are not currently realized.

Significance of findings

While there have been many studies on use of IWBs by teachers as indicated in chapter 2, the results of this study are unique in using quantitative measures to investigate the relationships between teaching beliefs about learning, teacher levels of concern about adoption, assessment techniques and usage of IWBs. Qualitative methods identified consistent patterns of IWB use and informed the development of the quantitative aspect of the study. The development of the archetypes from the initial quantitative survey is likely to provide very significant valuable information for IWB and other educational technology providers as well as teacher professional learning.

Valuable current information has been gained regarding archetypical use of IWBs and also about how IWBs are being used in contemporary K-12 Australian classrooms. For example, teachers who were regular IWB users preferred constructivist teaching approaches. As well, the sophisticated instrument being used to collect this data was developed and tested in this first phase of the study and will be further refined in the proposed ARC Linkage project. It should then provide a valuable instrument for measuring the relationships between teaching approaches, self-efficacy, adoption concerns, assessment techniques and innovative use of IWBs.

The discrete choice experiment methodology enables rigorous, reliable and efficient investigation of the relationships between attributes of the complex environment in which teachers operate. In this study this has permitted the investigation of relationships between rich tasks characteristics, medium of instruction and teacher preferences and approaches. This methodology has not been used in educational technology research previously.

The discrete choice experiment provides quantitative evidence confirming previous evidence from qualitative studies confirming that teaching is a complex activity. Teachers' choices at the technology-pedagogy interface are determined by a wide variety of factors.

The preference for authentic tasks and collaborative work among regular IWB users, when teaching the concept of Area in primary maths lessons, contrasts with previous research and anecdotal criticism suggesting that IWB use is primarily associated with presentational approaches. This highlights the need to further examine IWB use in a greater variety of contexts and domains.

LINKS BETWEEN THE CURRENT PROJECT AND FUTURE RESEARCH

The anticipated sequence to this project will be an ARC Linkage Grant with UTS and Electroboard as research partners. It will scale up the first project using its robust data collection instruments and analysis techniques. It will use surveys of large samples of teachers, students and school-based middle managers with relevant responsibilities to generate representative findings with high levels of confidence. In addition to mapping current technology-mediated practices across the curriculum, the project will employ classroom interventions and/or professional development interventions to test the relevance and effectiveness of selected innovations.

This Partnership research project is the essential first step in the development of an approach for studying new technology introduction, adoption, and adaptation in an educational context. The partnership grant provides resources for gathering information from relevant stakeholders and developing and piloting the diagnostic tool for assessing teachers' preferences, attitudes, and beliefs with respect to teaching practice and emerging technology. This project will underpin a larger scale linkage grant proposal for the November 2012 funding round.

The ARC Linkage project will allow thorough exploration of the underpinning teaching and learning views, attitudes, values, practices, cultural mores, affordances, constraints and outcomes (including student assessment results) associated with varied patterns of pedagogical and technological applications in school education. This larger project will explore and map the terrain of technology-mediated learning and teaching in schools by identifying current teaching practices and the thinking underpinning them. It will investigate students' engagement with digital learning technologies for knowledge building, explore patterns of collaborative learning, social and technical interactivity, and investigate how students enhance their learning using these technologies. Target technologies include IWBs and associated technologies. Findings about how digital technologies are currently facilitating learning and the choices influencing this use will inform the development, adoption and adaptation of new and emerging learning technologies for the classroom.

In this Linkage project, we will consider an in-depth investigation of how IWBs and associated technologies are being used to develop rich pedagogies in science and maths education. Key outcomes will be a scalable instrument that measures teacher decisions regarding rich pedagogies with emerging technologies and a clearer understanding of effective professional learning models. We will use the refined survey and the results of this study to inform the Linkage application and project.

The ARC Linkage proposal will demonstrate a complete research methodology for answering education research questions with respect to the interaction between teacher choice of pedagogy and an emerging technology. The combination of methods from education research and from the decision sciences provides a unique opportunity to relate theories of education practice with the characteristics, preferences, and actions of educators. The strength of this approach is that the ARC Linkage study will not only lead to research findings with respect to educational use of emerging technologies in Australia, but it will provide a rigorous and replicable template for future researchers desiring to test other education research hypotheses with a technology component.

Conclusion

This study provides quantitative and qualitative evidence confirming that teaching is a complex activity. Teachers' choices at the technology-pedagogy interface are determined by a wide variety of factors. This pioneering methodology in education research enabled the identification of the preferences and approaches of both regular and non-regular IWB users with regard to the characteristics of rich tasks. There are differences in the beliefs and approaches of regular and non-regular IWB users and these require further investigation, with a larger population and a variety of contexts and tasks.

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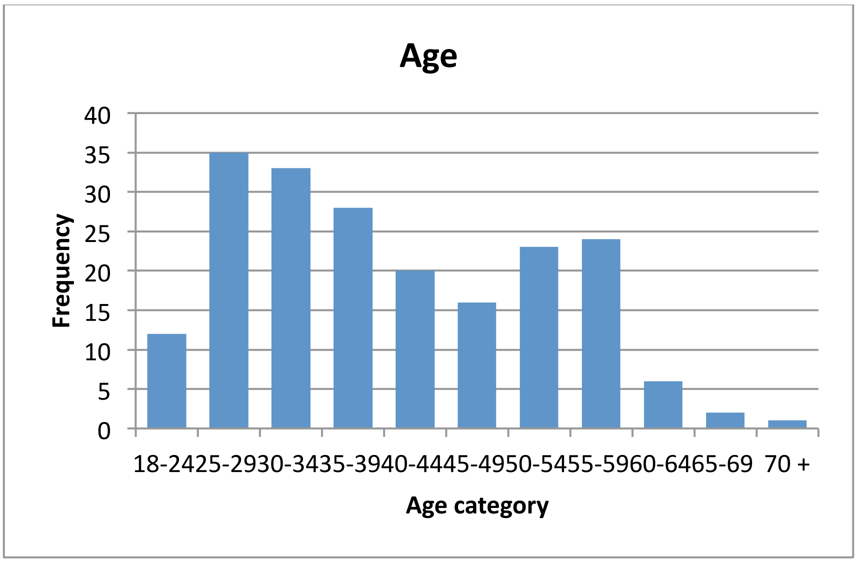
APPENDICES

APPENDIX A: ADDITIONAL FREQUENCY DATA



Interview duration

Task duration	Frequency	Percent
between 5-10	31	15.5
between 10-15	74	37
between 15-20	55	27.5
between 20-25	12	6
between 25-30	7	3.5
between 30-35	5	2.5
between 35-40	4	2
greater than 40	12	6

Qualification

Qualification	Frequency	Percent
Postgraduate Degree or equivalent	42	21
Graduate Diploma and Graduate Certificate from university or equivalent	37	18.5
Bachelor Degree or equivalent	97	48.5
Diploma of teaching	18	9
None of the above	6	3

Current responsibility

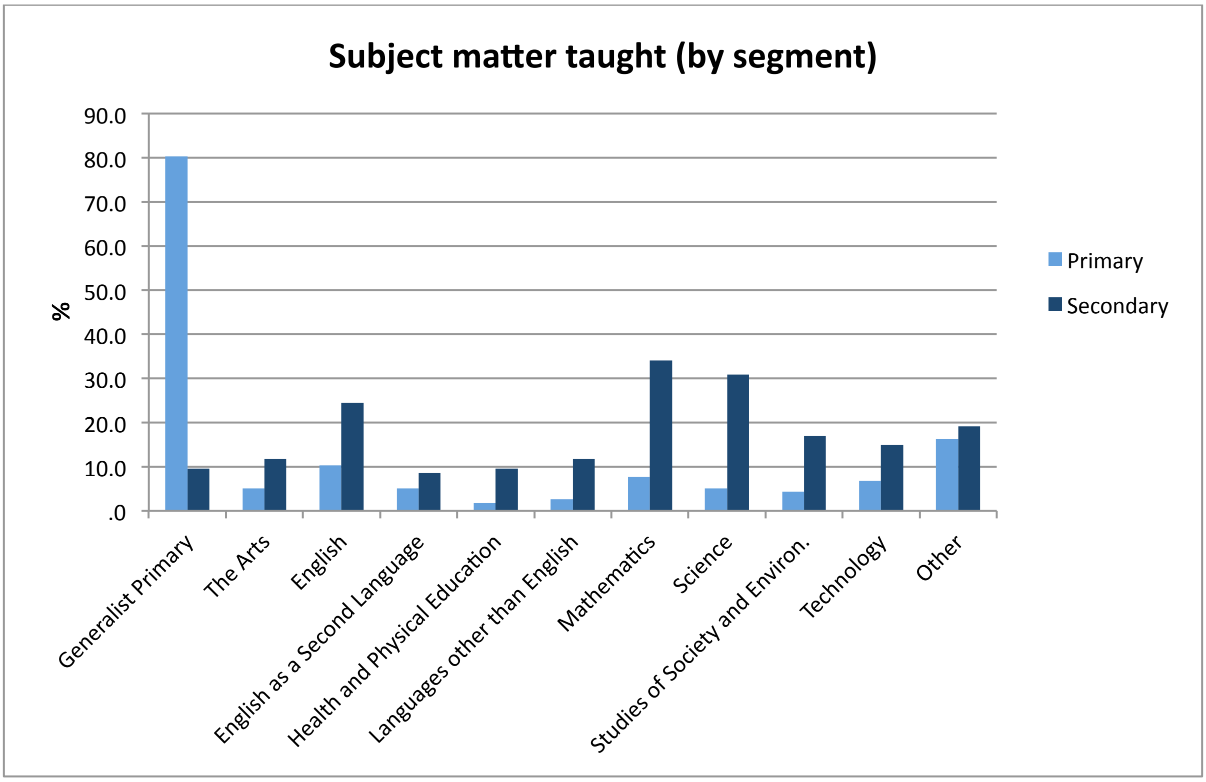
Current Responsibilities	Frequency	Percent
Principal	0	0
Deputy principal	2	1
Teaching deputy principal	3	1.5
Assistant principal	2	1
Leading or head teacher	26	13
Teacher	167	83.5

Subject matter

Subject Matter	Frequency	Percent*
Generalist Primary	97	48.5
The Arts	15	7.5
English	31	15.5
English as a Second Language	12	6
Health and Physical Education	11	5.5
Languages other than English	13	6.5
Mathematics	39	19.5
Science	34	17
Studies of Society and Environment	19	9.5
Technology	22	11
Other	31	15.5

**Does not add up to 100% - respondents could select multiple categories.*

Subject Matter	Primary (% yes)	Secondary (% yes)
Generalist Primary	80.3	9.6
The Arts	5.1	11.7
English	10.3	24.5
English as a Second Language	5.1	8.5
Health and Physical Education	1.7	9.6
Languages other than English	2.6	11.7
Mathematics	7.7	34.0
Science	5.1	30.9
Studies of Society and Environment	4.3	17.0
Technology	6.8	14.9
Other	16.2	19.1



Lesson prep location

Lesson Preparation	Frequency	Percent
School	57	28.5
Home	62	31
About evenly split between school and home	80	40
Other location	1	0.5

Number of classrooms

Number of classrooms	Frequency	Percent
less than 5	9	4.5
5 - 10	26	13.0
11 - 15	30	15.0
16 - 20	24	12.0
21 - 25	22	11.0
26 - 30	18	9.0
31 - 35	9	4.5
36 - 40	16	8.0
41 - 45	7	3.5
46 - 50	11	5.5
51 - 60	7	3.5
61 - 70	7	3.5
71 - 80	7	3.5
81 - 90	1	.5
91 - 100	3	1.5
101 - 125	3	1.5

Number of IWBs in school

Number of IWBs	Frequency	Percent
less than 5	62	31.0
5 - 10	54	27.0
11 - 15	35	17.5
16 - 20	19	9.5
21 - 25	13	6.5
26 - 30	5	2.5
31 - 35	5	2.5
46 - 50	3	1.5
51 - 60	2	1.0
61 - 70	1	0.5
101 - 125	1	0.5

U5. Other Application used on IWB (please specify)	Frequency
Acrobat	1
ActivInspire	1
Dynamic Geometry/Algebra Software	1
Easiteach	6
Interactive stories	1
Mathematic Specific Apps (i.e. Geogebra), Google E	1
My own	1
Notebook	2
One note	1
Photoshop, Kahootz, Excel, etc	1
Programs, eg The hat,	1
Smart Notebook	1
Story books, daily calendar	2
Ultranet	1
web cam, record-keeping	1
Word, Excel	3
Youtube	1

U11. The age and subject I think IWBs are appropriate for are:	Primary (% yes)	Secondary (% yes)
Younger primary students	88.0	81.9
Older primary students	94.0	91.5
Younger secondary students	96.6	90.4
Older secondary students	94.0	87.2
Maths	95.7	87.2
Science	94.9	90.4
Language studies	89.7	83.0

Assessment technique	Segment	Ranking (%)					
		1st	**2nd**	**3rd**	**4th**	**5th**	**6th**
Essay tests	Primary	1.7	1.7	7.7	19.7	29.9	39.3
	Secondary	3.2	9.6	6.4	30.9	26.6	23.4
Individual and group projects	Primary	18.8	28.2	23.9	12.8	9.4	6.8
	Secondary	16.0	28.7	22.3	12.8	11.7	8.5
Open-ended problems	Primary	46.2	14.5	17.9	7.7	8.5	5.1
	Secondary	42.6	12.8	16.0	11.7	8.5	8.5
Student presentations and performances	Primary	15.4	34.2	27.4	11.1	8.5	3.4
	Secondary	17.0	24.5	27.7	9.6	13.8	7.4
Standardised tests	Primary	12.0	5.1	11.1	15.4	22.2	34.2
	Secondary	8.5	10.6	11.7	10.6	19.1	39.4
Short-answer and multiple choice tests	Primary	6.0	16.2	12.0	33.3	21.4	11.1
	Secondary	12.8	13.8	16.0	24.5	20.2	12.8

Appendix B: Cross-tabulation data

Table 32 presents the trends from the cross tabulation of factor by archetype. This table includes trends from Teaching Level, Access, and Proficiency in addition to the Use and Attitude categories. A single arrow represents a percentage change of 10-24% from the expected frequency. A double arrow represents a percentage change greater than 24% from the expected frequency. A blank cell indicates a percentage change less than 10%. This table indicates that archetypes 1 and 2 typically follow the same trends, although archetype 2 exhibits less dramatic changes between responses.

Table 32: Trends from the cross tabulation of factor by archetype

Teaching level		**AT1**	**AT2**	**AT3**	**Pearson Chi-square**
Generalist primary	Yes	↓	↓	↑	0.056
	No	↑		↓	
Access					
Access to IWB	In room	↓	↓↓	↑↑	0.011
	Can book		↑	↓	
	No access	↑↑	↑	↓↓	
Percentage classrooms with IWB	<5%	↓↓	↑↑	↓↓	0.244
	5-20%	↑↑	↑	↓↓	
	20-40		↑	↓	
	40-80	↓	↓	↑	
	80-100	↓	↓	↑	
Proficiency					
Experience using IWB	Introductory	↑		↓	0.067
	Intermediate	↓↓		↑↑	
	Advanced	↓	↓↓	↑↑	
Received training	Yes	↓			0.355
	No	↑			
Would like to receive more training	Yes				0.858
	No		↑		
Challenge naming and saving files	Yes	↑↑		↓↓	0.094
	No	↓		↑	
I received support and training through online user groups	Yes	↓↓	↑↑		0.137
	No	↑			
Mode of use during class					
U1. I use an IWB as part of my lessons	Never	↑↑	↑	↓↓	0.002
	Rarely		↑	↓	
	Primarily as a starter activity	↓		↑	
	Throughout the whole lesson	↓↓	↓↓	↑↑	

U8. During classroom discussions	Yes	↓	↓	↑	0.037
	No	↑↑	↑↑	↓↓	
U5 Use application on IWB - Games	Yes	↓	↓	↑	0.067
	No	↑↑	↑↑	↓↓	
U15. An IWB is a regular feature in my classroom	Yes	↓↓	↓	↑↑	0.069
	No	↑	↑	↓	
U8. With the class or groups of students gathered close around the board	Yes	↓	↓	↑	0.105
	No	↑	↑	↓	
U11. Language studies	Yes				0.114
	No	↑	↑↑	↓↓	
U8. For teacher delivery to the whole class	Yes				0.125
	No	↑↑	↑	↓↓	
U8. To show videos to the class	Yes	↓			0.126
	No	↑↑		↓↓	
U11. Maths	Yes				0.136
	No	↑↑	↑	↓↓	
U5 Use application on IWB - Prepared lessons	Yes	↓		↑	0.183
	No	↑	↑	↓	
Mode of preparation					
U12.When I find resources others have created	Yes	↓		↑	0.04
	No	↑↑	↑	↓↓	
U10. I can adapt lesson plans from others	Yes	↓		↑	0.069
	No	↑↑		↓↓	
U8. To create new content and share it with others	Yes	↓		↑	0.191
	No	↑		↓↓	
Student Motivation					
U12. Because it helps the students learn more	Yes	↓		↑	0.006
	No	↑↑	↑	↓↓	
U14. My class is more interactive now that we have an IWB	Yes	↓		↑	0.02
	No	↑↑		↓↓	
U15. I am always looking for new ways for the students to interact with the technology	Yes		↓	↑	0.022
	No	↑↑	↑↑	↓↓	
U6. It improves student learning	Yes	↓			0.024

	No	↑↑		↓↓	
U12. Because the students enjoy the lessons more	Yes	↓		↑	0.028
	No	↑↑	↑	↓↓	
U14. The students share more ideas and ask more questions now that we have an IWB	Yes	↓		↑	0.036
	No	↑↑		↓	
U6. The students expect it	Yes	↓		↑	0.083
	No	↑		↓	
U15. The more students use the IWB the better	Yes	↓		↑	0.105
	No	↑↑		↓	
U13. I think that an IWB distracts students from educational content	Agree	↑↑	↑↑	↓↓	0.167
	Disagree				
U14. Using an IWB in class can lead to improved student outcomes	Agree				0.176
	Disagree	↑↑		↓↓	
Management Motivation					
U15 . Changing my lesson plans to incorporate the new technology would take more time than I have	Yes	↑↑	↑↑	↓↓	0.013
	No	↓	↓	↑	
U12. Because it helps me to be more organised	Yes	↓		↑	0.027
	No	↑↑		↓↓	
U13. I find it a significant inconvenience to redo my lesson plans for use with an IWB	Yes	↑↑	↑	↓↓	0.047
	No	↓		↑	
U6. It is convenient	Yes				0.132
	No	↑↑		↓↓	
U12. When I find the time	Yes				0.161
	No	↑	↑↑	↓↓	
U15. The IWB has helped me to be more efficient in preparing and revising lesson plans	Yes	↓		↑	0.171
	No	↑		↓	
Personal Motivation					
U13. The IWB gets in the way of other things I want to do	Yes	↑	↑↑	↓↓	0.046
	No		↓	↑	
U15 . I don't really see a need for this technology	Yes	↑↑	↑↑	↓↓	0.046
	No				

U15. I would prefer to use a regular whiteboard	Yes	↑↑	↑↑	↓↓	0.088
	No	↓	↓	↑	

It is important to interpret Table 32 as showing differences FROM the average response rather than showing differences IN the average response. The remaining discussion in this paragraph describes one entry from Table 32 as an example for interpreting the data: From Table 33 we can see that only 43 individuals indicated that they had challenges naming and saving files versus 113 that did not. This means that on average we expect fewer individuals, regardless of their particular weighting on the archetypes, to have challenges naming and saving files compared to those who do. Based on the composition of the archetype weighting in the population (for this question AT1: 28%, AT2: 27%, AT3: 45%) we can calculate the expected frequency of each choice for each archetype as shown on the first two lines in Table 33. We can then calculate the percentage difference between the observed frequency and the expected frequency, shown on the fifth and sixth lines in Table 33. A positive percentage means that we observed more of a particular response for a particular archetype than we expected—as is the case for 'Yes' answers in Archetype 1. A negative percentage means that we observed less of a particular response for a particular archetype than we expected—as is the case for 'Yes' answers in Archetype 3. We interpret this result by saying that individuals with high weight on Archetype 1 are more likely than the population average to have trouble naming and saving files while those with high weight on Archetype 3 are less likely than the population average. A similar procedure was followed to populate each question in Table 32.

Table 33: Expected and observed responses by archetype and the percentage difference between the observed and expected responses for each archetype

Challenge naming and saving files	Number of Respondents	Archetype 1	Archetype 2	Archetype 3
Expected 'Yes' answers	43	12.1	11.6	19.3
Expected 'No' answers	113	31.9	30.4	50.7
Observed 'Yes' answers	43	17	12	14
Observed 'No' answers	113	27	30	56
'Yes' Percentage difference		40%	4%	-27%
'No' Percentage difference		-15%	-1%	10%

Below are the actual cross-tab tables for the trends shown in Table 32.

Demographics

Teaching level	Number of Respondents	AT 1	AT 2	AT 3	Significance (Chi-square test)
K-3	89	27%	27%	46%	0.311
4-6	63	29%	21%	50%	0.169
7-10	79	36%	31%	33%	0.210
11-12	61	36%	32%	31%	0.202

Generalist - Primary	Number of Respondents	AT 1	AT 2	AT 3	Significance (Chi-square test)
Yes	98	26%	26%	49%	.056
No	104	37%	31%	33%	

Teaching status	Number of Respondents	AT 1	AT 2	AT 3	Significance (Chi-square test)
Full time	114	32%	27%	41%	.779
part time	76	32%	29%	38%	
away from teaching	10	22%	21%	57%	

Years experience	Number of Respondents	AT 1	AT 2	AT 3	Significance (Chi-square test)
0-2	26	23%	35%	42%	1.000
3-5	37	30%	27%	43%	
6-10	41	32%	29%	39%	
11-15	22	32%	32%	36%	
16-20	16	38%	25%	38%	
21-25	18	33%	22%	44%	
26-30	23	35%	22%	43%	
31+	17	29%	29%	35%	

age	Number of Respondents	AT 1	AT 2	AT 3	Significance (Chi-square test)
18-24	12	25%	33%	42%	1.000
25-29	35	31%	29%	40%	
30-34	33	30%	24%	45%	
35-39	28	36%	29%	39%	
40-44	20	30%	35%	35%	
45-49	16	31%	25%	44%	
50-54	23	35%	26%	39%	
55-59	24	33%	25%	38%	
60-64	6	33%	17%	50%	
65-69	2	0%	50%	50%	
70+	1	0%	0%	0%	

Student enrolment	Number of Respondents	AT 1	AT 2	AT 3	Significance (Chi-square test)
<50	12	42%	25%	33%	.911
50-200	22	32%	18%	50%	

201-400	51	33%	24%	43%	
401-600	36	22%	36%	44%	
601-800	25	36%	24%	40%	
801-1000	20	25%	35%	40%	
>1000	34	35%	32%	32%	

Type of school	Number of Respondents	AT 1	AT 2	AT 3	Significance (Chi-square test)
State	134	33%	28%	39%	.935
Independent religious	23	35%	26%	39%	
Independent secular	15	33%	27%	40%	
Catholic systemic	28	21%	29%	50%	

Location of school	Number of Respondents	AT 1	AT 2	AT 3	Significance (Chi-square test)
Metropolitan	135	33%	30%	38%	.749
Provincial	53	28%	25%	47%	
Remote	11	36%	18%	45%	

Access

Access to IWB	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
In room	86	26%	21%	53%	0.011
Can book	70	31%	33%	36%	
No access	44	43%	34%	23%	

Percentage classrooms with IWB	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
<5%	10	20%	50%	30%	0.244
5-20%	50	40%	32%	28%	
20-40%	38	34%	32%	34%	
40-80%	40	28%	23%	50%	
80-100%	62	27%	23%	50%	

Note: More data should clarify this trend

PROFICIENCY

Experience using IWB	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Introductory	112	38%	29%	32%	.067
Intermediate	69	22%	28%	51%	
Advanced	19	26%	21%	53%	

Received training	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	95	26%	28%	45%	.355
No	95	36%	26%	38%	

Challenge naming and saving files	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	43	40%	28%	33%	.094
No	113	24%	27%	50%	

I received support and training through online user groups	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	12	8%	50%	42%	.137
No	83	29%	25%	46%	

Note: More data is required to support this finding

MODE OF USE DURING CLASS

U1. I use an IWB as part of my lessons	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Never	51	45%	33%	22%	.002
Rarely	59	32%	34%	34%	
Primarily as a starter activity	53	26%	26%	47%	
Throughout the whole lesson	40	20%	15%	65%	

U8. During classroom discussions	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	108	25%	23%	52%	.037
No	50	36%	34%	30%	

U5 Use application on IWB - Games	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	89	26%	21%	53%	.067
No	69	32%	33%	35%	

U15. An IWB is a regular feature in my classroom	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	62	21%	23%	56%	.069
No	95	33%	29%	38%	

U8. With the class or groups of students gathered close around the board	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	88	24%	24%	52%	.105
No	68	34%	31%	35%	

U11. Language studies	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	175	31%	26%	43%	.114
No	26	35%	42%	23%	

U8. For teacher delivery to the whole class	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	126	26%	25%	49%	.125
No	31	39%	32%	29%	

U8. To show videos to the class	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	120	25%	26%	49%	.126
No	37	41%	27%	32%	

U11. Maths	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)

Yes	185	30%	28%	42%	.136
No	16	50%	31%	19%	

U5 Use application on IWB - Prepared lessons	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	90	24%	24%	51%	.183
No	66	33%	30%	36%	

MODE OF PREPARATION

When I find resources others have created	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	108	24%	24%	52%	.040
No	49	39%	31%	31%	

U10. I can adapt lesson plans from others	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	121	24%	26%	50%	.069
No	36	42%	28%	31%	

U8. To create new content and share it with others	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	74	23%	24%	53%	.191
No	83	33%	29%	39%	

STUDENT INSPIRED MOTIVATION FOR USE

U12. Because it helps the students learn more	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	109	22%	25%	53%	.006
No	48	42%	31%	27%	

U14. My class is more interactive now that we have an IWB	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Agree	103	22%	25%	52%	.020
No	55	40%	29%	31%	

U15. I am always looking for new ways for the students to interact with the technology	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	128	26%	24%	50%	.022
No	28	39%	39%	21%	

U6. It improves student learning	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	162	27%	28%	44%	.024
No	39	49%	26%	26%	

U12. Because the students enjoy the lessons more	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	115	24%	24%	51%	.028
No	43	40%	33%	28%	

U14. The students share more ideas and ask more questions now that we have an IWB	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Agree	85	21%	25%	54%	.036
No	72	36%	29%	35%	

U6. The students expect it	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	103	25%	28%	47%	.083
No	99	38%	28%	33%	

U15. The more students use the IWB the better	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	98	23%	26%	51%	.105
No	58	36%	29%	34%	

U13. I think that an IWB distracts students from educational content	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Agree	25	36%	36%	28%	.167
No	132	27%	25%	48%	

U14. Using an IWB in class can lead to improved student outcomes	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Agree	131	26%	26%	48%	.176
No	26	42%	27%	31%	

MANAGEMENT INSPIRED MOTIVATION FOR USE

U15 . Changing my lesson plans to incorporate the new technology would take more time than I have	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	59	36%	34%	31%	.013
No	97	24%	22%	55%	

U12. Because it helps me to be more organised	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	94	21%	26%	53%	.027
No	63	38%	29%	33%	

U13. I find it a significant inconvenience to redo my lesson plans for use with an IWB	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Agree	63	37%	30%	33%	.047
No	93	23%	25%	53%	

U6. It is convenient	Number of Respondents	Archetype 1	Archetype 2	Archetype 3	Significance (Chi-square test)
Yes	161	29%	28%	43%	.132

No	39	44%	28%	28%	

U12. When I find the time	**Number of Respondents**	**Archetype 1**	**Archetype 2**	**Archetype 3**	**Significance (Chi-square test)**
Yes	120	27%	24%	49%	.161
No	38	34%	34%	32%	

U15. The IWB has helped me to be more efficient in preparing and revising lesson plans	**Number of Respondents**	**Archetype 1**	**Archetype 2**	**Archetype 3**	**Significance (Chi-square test)**
Yes	78	23%	24%	53%	.171
No	79	33%	29%	38%	

PERSONAL MOTIVATION FOR USE

U13. The IWB gets in the way of other things I want to do	**Number of Respondents**	**Archetype 1**	**Archetype 2**	**Archetype 3**	**Significance (Chi-square test)**
Agree	41	34%	37%	29%	.046
No	115	26%	23%	51%	

U15 . I don't really see a need for this technology	**Number of Respondents**	**Archetype 1**	**Archetype 2**	**Archetype 3**	**Significance (Chi-square test)**
Yes	20	45%	35%	20%	.046
No	137	26%	26%	49%	

U15. I would prefer to use a regular whiteboard	**Number of Respondents**	**Archetype 1**	**Archetype 2**	**Archetype 3**	**Significance (Chi-square test)**
Yes	45	36%	33%	31%	.088
No	113	26%	24%	50%	

APPENDIX C: ADDITIONAL ARCHETYPAL ANALYSIS

SAMPLE COMPOSITION BY ARCHETYPE

Table 34 shows a decomposition of the teacher respondent sample according to the largest two archetype weights for each individual. The rows correspond to the largest archetype weight for each individual, and the columns correspond to the second largest archetype for each individual. For example, forty-eight individuals had the most weight on archetype 3 and the second most weight on archetype 1. This corresponds to the bottom left cell of the table. Two individuals had all weight on archetype 1, two individuals had all weight on archetype 2, and 1 individual had all weight on archetype 3. This corresponds to the main diagonal (left to right) of the table. The next most common grouping is archetype 1 as primary combined with archetype 3 as secondary (36 individuals) followed closely by archetype 3 as primary with archetype 2 as secondary (35 individuals). Combinations of archetypes 2 and 1 are the least common combinations.

Archetype 3 is the most frequent primary archetype, followed by archetype 1. The secondary archetypes are distributed more or less evenly across the archetypes. The result is that three fourths of the sample has a primary or secondary weight on archetype 3. This means that 76% of teachers exhibited responses that had a least some similarity to the archetype 3 responses although only 42% of respondents had a primary weight on archetype 3.

Table 34: Decomposition of teacher sample according to the two largest archetype weights for each individual

	Secondary Archetype			
Primary Archetype	AT 1	AT 2	AT 3	**Primary archetype counts**
AT 1	2	27	36	65
AT 2	17	2	32	51
AT 3	48	35	1	84
Secondary archetype counts	67	64	69	

ARCHETYPE DIMENSIONS

Figure 8 shows the profiles of the three archetypes. The x-axis is labelled with the individual survey items. The vertical dashed lines separate the items according to teacher beliefs about teaching and learning (11 items), teacher opinions about the value of assessment techniques for measuring student learning (6 items), and stages of concern with respect to IWBs (7 items). The first four items listed were identified in the literature as constructivist oriented. The subsequent seven items were identified as transmissive oriented. The following six items are the assessment techniques, and the final seven items correspond to the stages of concern.

The y-axis stacks the archetype profiles. The height of each bar shows the contribution of a specific item to the archetype profile. We have labelled each archetype with the percentage weight it has in describing the overall sample population. These percentage numbers should not be interpreted as the percentage of individuals in the sample identical to the archetype profile. Rather, the percentages should be interpreted as weights for describing the sample response.

We can study individual respondents by examining their individual weights for each archetype. For example we find that 51 individuals out of 200 have the highest weight for the archetype 2, 36% of the respondents have 80% or greater weight from a single archetype, and 70% of respondents have 95% or greater weight from a mixture of 2 archetypes.

All the teacher beliefs questions were binary responses for example, yes or no, so the choices available to individual respondents are represented as a zero for disagree with the item as paraphrased or one for agree with item as paraphrased. Four of the teacher beliefs items were paired comparison questions. In this case a one corresponds to agreeing most with the first statement listed as contrasted with the second statement listed.

Teachers ranked the assessment techniques from one to six according to one being the most useful in judging how well students are learning and six being the least useful in judging how well students are learning. These values were rescaled between zero and two for the archetype analysis, so a score of zero in Figure 8 corresponds to a first rank, and a score of two corresponds to a last rank.

The stages of concern scores were calculated by summing the total number of times a teacher selected each stage as most accurately describing her perceptions concerning IWBs and summing the number of times a teacher selected each stage as least accurately describing her perceptions concerning IWBs. The difference between the most and least sums for each stage is the teacher's score for each stage of concern. The minimum possible score for a stage is -4, and the maximum possible score for a stage is +4. The raw scores were scaled for the archetype analysis so that a score of 2 in Figure 8 corresponds to a stages-of-concern score of +4, and a score of 0 in Figure 8 corresponds to a score of -4.

The stages of concern scores are interpreted by comparing the relative scores between stages. For example, archetype 3 has a score of 1.3 for stage 1 (informational), a 1.1 for stage 2 (personal), and scores of 1 or less for the other stages. A score below 1 indicates that this stage was more frequently chosen as least rather than most accurately describing a teacher's perceptions. A respondent well described by archetype 2 would have chosen concerns from stage 1 (informational) as most accurately describing her perceptions more frequently than any other stage and would have chosen concerns from stage 4 (consequence) as least accurately describing her perceptions concerning IWBs more frequently than any other stage. This individual would be identified as having informational concerns with respect to IWBs.

The printed numbers that overlay the bars for the assessment techniques and the stages of concern are the rank order of these items for the particular archetype.

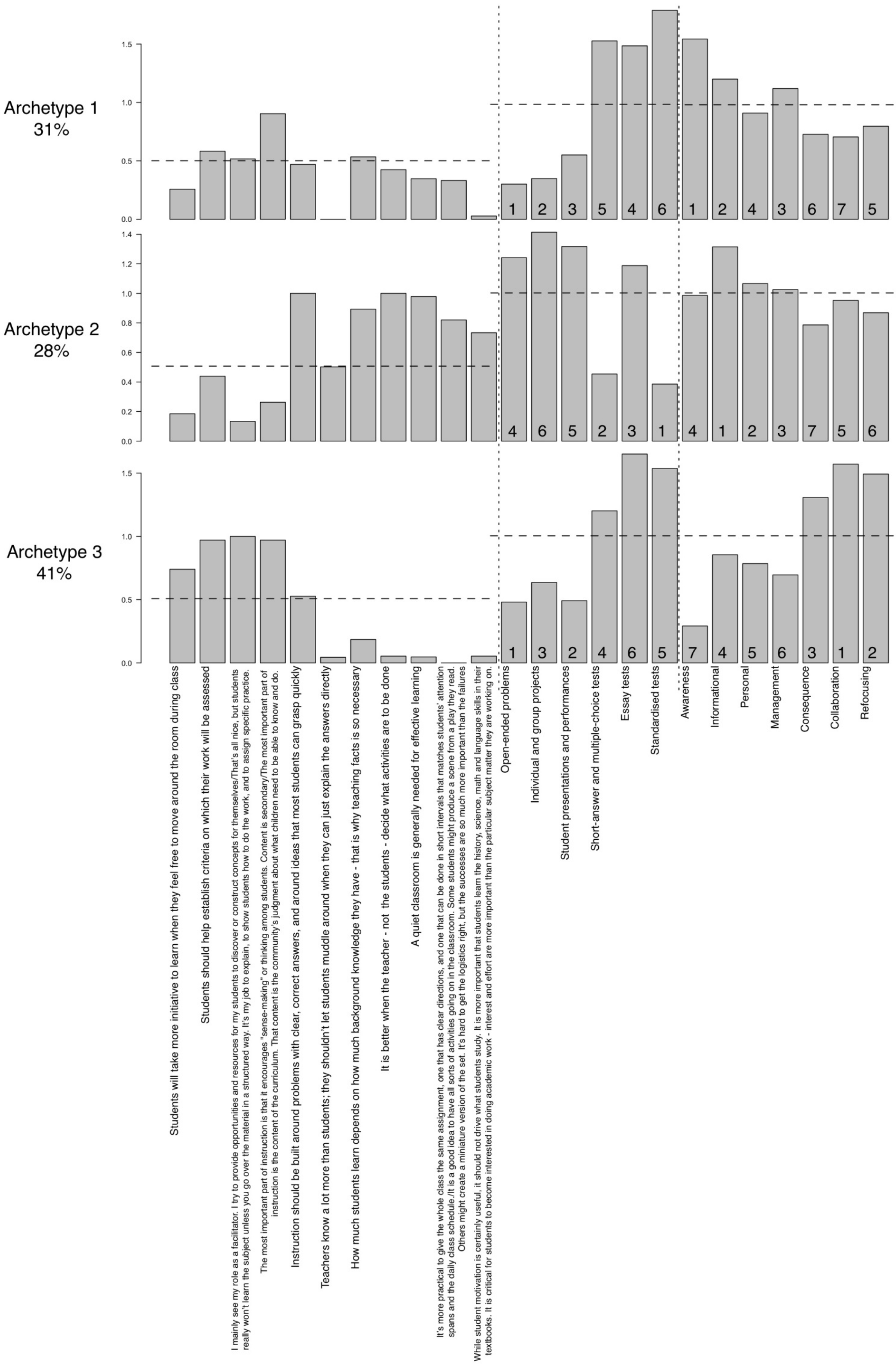


Figure 8: Profiles for three archetypes based on teacher beliefs, opinions of assessment techniques, and stages of concern regarding IWB

ARCHETYPE PROFILE DESCRIPTIONS

While access and use patterns vary considerably across the 200 surveyed teachers, the majority of respondents had favourable responses to most questions regarding their attitudes towards IWBs as can be seen by studying the summary statistics report. However, the respondents with less access, less use, and less favourable opinions of IWBs are more likely to have heavier weights on archetypes 1 and 2. We can compare differences between archetypes by examining the relative response rates for each question according to archetype. This is called a cross tabulation.

We can compare the average archetype weights across demographic and other data. For example, differences in archetype weights between year 4-6 teachers and year 7-10 teachers would indicate that on average these groups answered the beliefs, assessment techniques, and stages of concern questions differently.

We can also perform a statistical test (i.e., Chi-square test) on the cross-tabulation between the variable of interest and the archetype weights. The lower the value computed to test significance, the more confidence we have that there is a relationship between changes in the variable of interest and the archetype weights. Values below 0.1 (90% confidence) indicate a likely strong relationship. The results of the Chi-square test are not definitive given the small sample size of the study. Factors that do not appear significant in our results may be significant in the larger population. The cross-tabulations for the demographic, access, and proficiency questions are listed in the appendix.

The most significant demographic variables appear to be the teaching level. Primary teachers have more weight on archetype 3 than secondary teachers. It is interesting to note that teaching status, age, years of experience, type of school, and location of school do not appear to be related to archetype weighting.

Access to an IWB is strongly related to archetype weighting with those that have an IWB in their classroom exhibiting the most weight on archetype 3. The percentage of IWBs in the schools also appears to have similar relationship, but this needs to be verified with a larger sample and if possible a more accurate method of assessment of the percentage of classrooms with an IWB.

In terms of proficiency, advanced IWB users typically have more weight on archetype 3, while weight on archetype 1 appears to decrease between introductory users and advanced users. This notion is supported by differences in the stages of concern scores between archetypes 1 and 3, where archetype 1 has lower level concerns, and archetype 3 has concerns related to consequence for students, professional collaboration, and technology refocusing. For teachers that have challenges naming and saving files more weight is placed on archetype 1 rather than archetype 3. This again supports the notion that teachers with more weight on archetype 1 are at an early stage of IWB use compared with those in archetype 3.

Perhaps as interesting as the finding that teacher beliefs and IWB concerns are unrelated to demographics such as experience, age, or school type is the finding that several of the use and attitude measures do appear related to the archetype weightings.

We break the use and attitude questions into several sections according to the mode of use during class, the mode of teacher preparation, the level of student inspired motivation for IWB use, the level of classroom management inspired IWB use, and the level of personal preference inspired motivation for IWB use.

CROSSTABS ORDERED BY PEARSON CHI-SQUARE STATISTIC

Table 35 presents the most significant factors based on cross tabulation in order of significance. The classification of each factor is also included. Student inspired motivation is heavily represented throughout the list especially in the most significant factors. This result is driven largely by the high weighting on archetype 3 for individuals who saw the IWBs as helpful for students. How teachers use the IWB in class was the most significant single factor with a high weight on archetype 3 for teachers that use the IWB throughout the lesson and a low weight on archetype 3 for teachers who never or rarely use the IWB. Management and personal motivation also featured prominently. We present in the appendix the complete cross-tabulation of each factor by the archetype weighting.

Table 35: List of teacher use and attitude factors for IWBs in order of significance based on a cross-tabulation between factor and archetype weighting

Rank	Survey item	Pearson Chi-square	Classification
1	U1. Use an IWB as part of lesson	0.002	Mode of use
2	U12_3 because it helps students learn more	0.006	Student motivation
3	U15_13 Changing my lesson plans to incorporate the new technology would take more time than I have	0.013	Management motivation
4	U14_4 My class is more interactive now that we have an IWB	0.02	Student motivation
5	U15_5 I am always looking for new ways for students to interact with the technology	0.022	Student motivation
6	U6_6 it improves student learning (interesting difference between AT_1 and AT_3)	0.024	Student motivation
7	U12_5 because it helps me to be more organized	0.027	Management motivation
8	U12_7 because the students enjoy the lessons more	0.028	Student motivation
9	U14_5 Students share more ideas and ask more question now that we have an IWB	0.036	Student motivation
10	U8_4 During classroom discussions	0.037	Mode of use
11	U12_2 when I find resources others have created	0.04	Mode of preparation
12	U13_4 the IWB gets in the way of other things I want to do	0.046	Personal motivation/ambiguous
13	U15_10 I don't really see a need for this technology	0.046	Personal motivation/ambiguous

14	U13_1 a significant inconvenience to redo my lesson plans for use with and IWB	0.047	Management motivation
16	U5_5 use on IWB – Games	0.067	Mode of use
17	U10_1 I can adapt lesson plans from others	0.069	Mode of preparation
18	U15_6 An IWB is a regular feature in my classroom	0.069	Mode of use
19	U6_2 the students expect it	0.083	Student motivation
21	U15_9 I would prefer to use a regular whiteboard	0.088	Personal motivation/ambiguous
24	U8_2 with the class or groups of students gathered close around the board	0.105	Mode of use
25	U15_3 The more students use the IWB the better	0.105	Student motivation
26	U11_7 Language studies	0.114	Mode of use
27	U8_1 teacher delivery to the whole class	0.125	Mode of use
28	U8_5 show videos to the class	0.126	Mode of use
29	U6_3 it is convenient	0.132	Management motivation
30	U11_5 maths	0.136	Mode of use
33	U12_1 when I find time	0.161	Management motivation
34	U13_6 I think that an IWB distracts students from educational content	0.167	Student motivation
35	U15_4 The IWB has helped me to be more efficient in preparing and revising lesson plans	0.171	Management motivation
36	U14_1 Using an IWB in class can lead to improved student outcomes	0.176	Student motivation
37	U5_6 prepared lessons	0.183	Mode of use
38	U8_7 to create new content and share it with others	0.191	Mode of preparation

APPENDIX D: STAGES OF CONCERN ITEMS DESCRIPTION

Stages of Concern[1,2]

0 **Awareness**: Little concern about or involvement with the innovation is indicated

1 **Informational**: A general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about herself in relation to the innovation. She is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use.

2 **Personal**: Individual is uncertain about the demands of the innovation, her inadequacy to meet those demands, and her role with the innovation. This includes analysis of her role in relation to the reward structure of the organization, decision making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implication of the program for self and colleagues may also be reflected.

3 **Management**: Attention is focused on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are utmost.

4 **Consequence**: Attention focuses on impact of the innovation on students in her immediate sphere of influence. The focus is on relevance of the innovation for student, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes.

5 **Collaboration**: The focus is on coordination and cooperation with others regarding use o the innovation.

6 **Refocusing**: The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the propose or existing from of the innovation.

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[1] Original concept from Hall, G.E., Wallace, R.C., Jr., & Dossett, W.A. *A developmental conceptualization of the adoption process within educational institutions*. Austin: Research and Development Center for Teacher Education, The University of Texas, 1973.

[2] This page transcribed from Figure I.2 Stages of Concern About the Innovation from Hall, G. E., George, A. A., Rutherford, W.L. *Measuring Stages of Concern about the Innovation: A Manual for the Use of the SoC Questionnaire*. Texas University, Austin. Research and Development Center for Teacher Education, 1977.

Stages of Concern Items adapted for IWBs

0 I am more concerned about another innovation rather than IWBs

I am unconcerned about IWBs at this time

I am preoccupied with things other than IWBs

I spend little time thinking about IWBs

Currently, other priorities prevent me from focusing my attention on IWBs

1 I have very limited knowledge about IWBs

I would like to discuss the possibility of using an IWB

I would like to know what resources are available if we decide to use IWBs

I would like to know what the use of IWBs will require in the immediate future

I would like to know how IWBs are better than what we have now

2 I would like to know the effect on my professional status of deploying an IWB in my classroom

I would like to know who will make the decisions about how IWBs are deployed and used

I would like to know how my teaching or administration is supposed to change with IWBs

I would like to have more information about how much time and energy I would have to spend to incorporate IWBs

I would like to know how my job would change when I am using IWBs

3 I am concerned about not having enough time to organise myself each day including lessons with IWBs

I am concerned about conflict between my interests and my responsibilities with respect to IWBs

I am concerned about my inability to manage all the IWB requires

I am concerned about time spent working with non-academic problems related to IWBs

Coordination of tasks and people is taking too much of my time

4 I am concerned about students' attitudes towards IWBs

I am concerned about how IWBs affect students

I am concerned about evaluating my impact on students

I would like to excite my students about their part in using IWBs

I would like to use feedback from my students to change the program

5 I would like to help other teachers in their use of IWBs

I would like to develop working relationships with both our faculty and outside faculty using IWBs

I would like to familiarise other departments or persons with the progress of IWBs

I would like to coordinate my efforts with others to maximise the IWB's effects

I would like to know what other teachers are doing with IWBs

6 I now know of some other approaches that might work better than IWBs

I am concerned about revising my use of IWBs

I personally would like to modify the teaching approach with IWBs

I would like to modify the use of IWBs based on the experiences of our students

I would like to determine how to supplement, enhance, or replace IWBs

APPENDIX E: TEACHER SEGMENT ANALYSIS FULL RESULTS

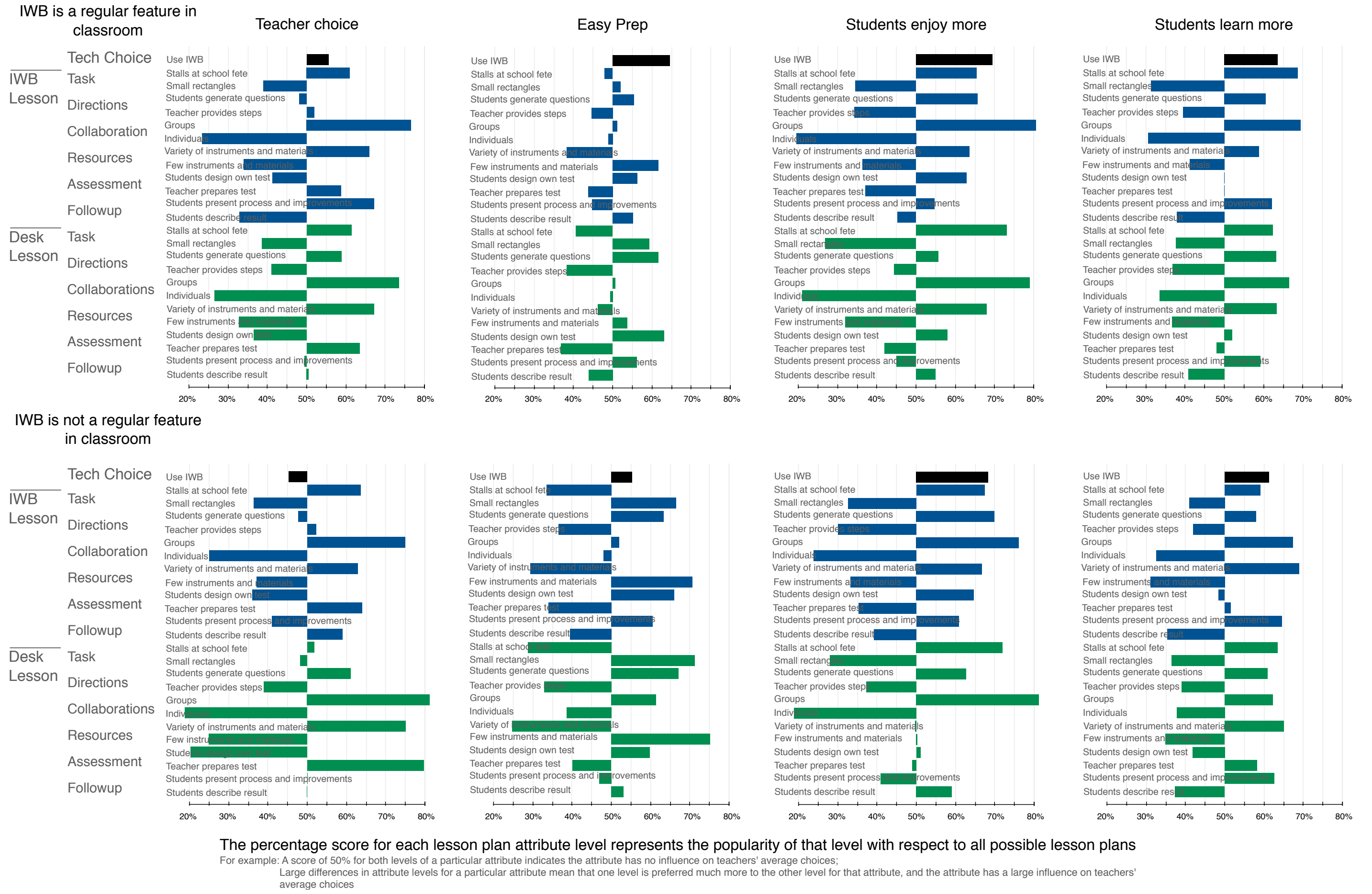

Figure 9: Lesson plan attribute level performance for teacher choice, easy prep, students enjoy more, and students learn more choice experiments. The top panel corresponds to those teachers who agreed that the IWB is a regular feature in their classroom. The bottom panel corresponds to those teachers who disagreed that the IWB is a regular feature in their classroom.

APPENDIX F: SURVEY SCREENSHOTS

UTS:L&C CENTRE FOR RESEARCH IN LEARNING AND CHANGE

UTS:CenSoC Centre for the Study of Choice

WELCOME!

Thank you for agreeing to participate in this survey. The survey will take about 15 minutes to complete.

This study is being conducted by researchers in the Centre for Research in Learning and Change and Centre for the Study of Choice at the University of Technology, Sydney.

This research is being completed in partnership with Electroboard.

The purpose of this study is to understand how teachers think about their lessons from a number of different perspectives. The research findings will ultimately lead to insights that can better direct resources based on what teachers value when it comes to their role as educators.

All your answers to the questions are strictly anonymous. No one will contact you after the survey, and no sales solicitation is involved. Your answers will be used for research purposes only.

Note:

Please DO NOT USE the 'Back' and 'Forward' buttons in the browser. Please use the buttons at the bottom of each screen.

If you would like to pause the survey and return to it later, simply close the window and click on the original link in the invitation. It will return you to the last point of entry in the survey.

Please click on " >> " to start the survey.

>>

UTS:L&C CENTRE FOR RESEARCH IN LEARNING AND CHANGE
UTS:CenSoC Centre for the Study of Choice

CHOICE TASK ONE: WHICH LESSON WILL YOU DELIVER?

In the next week, you will be running a lesson in mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on what you are more likely to do:

Set 1 of 8

Features	Lesson A	Lesson B
TASK:	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas
DIRECTIONS:	**You** will **provide** a sequence of **steps** to guide students through the activity	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work individually**	Students will **work in groups**
RESOURCES:	Students will use only **a few measuring instruments and materials** to complete task	Students will use only **a few measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **cardboard shapes on a desk**	Students will consider various areas in the form of **shapes** on the **Interactive White Board**
ASSESSMENT:	**Students design** their own **test** to complete	**You** will **prepare** a **test** for students to complete
FOLLOW UP:	Students will present a report **reflecting on** the **process used and possible improvements**	Students will present a report **reflecting on** the **process used and possible improvements**
Which of the two lessons are you most likely to deliver to your students?	◯ Lesson A	◯ Lesson B

Thinking realistically about your most preferred lesson plan you just chose, if you had to deliver this lesson would you find this a satisfactory way to do it?

◯ Yes, this would be satisfactory

◯ No, this would be unsatisfactory

>>

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CHOICE TASK ONE: WHICH LESSON WILL YOU DELIVER?

In the next week, you will be running a lesson in mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on what you are more likely to do:

Set 2 of 8

Features	Lesson A	Lesson B
TASK:	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas
DIRECTIONS:	**You** will **provide** a sequence of **steps** to guide students through the activity	**You** will **provide** a sequence of **steps** to guide students through the activity
COLLABORATION:	Students will **work in groups**	Students will **work individually**
RESOURCES:	Students will combine their learning with **a variety of measuring instruments and materials** to complete task	Students will combine their learning with **a variety of measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **shapes** on the **Interactive White Board**	Students will consider various areas in the form of **shapes** on the **Interactive White Board**
ASSESSMENT:	**You** will **prepare** a **test** for students to complete	**You** will **prepare** a **test** for students to complete
FOLLOW UP:	Students will present a report **reflecting on the process used and possible improvements**	Students will present a report **describing what** they have **found**

Which of the two lessons are you most likely to deliver to your students?	◯ Lesson A	◯ Lesson B

Thinking realistically about your most preferred lesson plan you just chose, if you had to deliver this lesson would you find this a satisfactory way to do it?

◯ Yes, this would be satisfactory

◯ No, this would be unsatisfactory

>>

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CHOICE TASK ONE: WHICH LESSON WILL YOU DELIVER?

In the next week, you will be running a lesson in mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on what you are more likely to do:

Set 3 of 8

Features	Lesson A	Lesson B
TASK:	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas
DIRECTIONS:	**Students** will **generate** their **own questions** to investigate things they need to find out	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work individually**	Students will **work individually**
RESOURCES:	Students will combine their learning with **a variety of measuring instruments and materials** to complete task	Students will combine their learning with **a variety of measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **cardboard shapes on a desk**	Students will consider various areas in the form of **shapes** on the **Interactive White Board**
ASSESSMENT:	**You** will **prepare** a **test** for students to complete	**Students design** their own **test** to complete
FOLLOW UP:	Students will present a report **describing what they** have **found**	Students will present a report **reflecting on** the **process used and possible improvements**

Which of the two lessons are you most likely to deliver to your students?	○ Lesson A	○ Lesson B

Thinking realistically about your most preferred lesson plan you just chose, if you had to deliver this lesson would you find this a satisfactory way to do it?

○ Yes, this would be satisfactory

○ No, this would be unsatisfactory

>>

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CHOICE TASK ONE: WHICH LESSON WILL YOU DELIVER?

In the next week, you will be running a lesson in mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on what you are more likely to do:

Set 4 of 8

Features	Lesson A	Lesson B
TASK:	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas
DIRECTIONS:	**Students** will **generate** their **own questions** to investigate things they need to find out	**You** will **provide** a sequence of **steps** to guide students through the activity
COLLABORATION:	Students will **work in groups**	Students will **work in groups**
RESOURCES:	Students will use only **a few measuring instruments and materials** to complete task	Students will use only **a few measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **shapes** on the **Interactive White Board**	Students will consider various areas in the form of **shapes** on the **Interactive White Board**
ASSESSMENT:	**Students design** their own **test** to complete	**Students design** their own **test** to complete
FOLLOW UP:	Students will present a report **describing what they** have **found**	Students will present a report **describing what they** have **found**
Which of the two lessons are you most likely to deliver to your students?	◯ Lesson A	◯ Lesson B

Thinking realistically about your most preferred lesson plan you just chose, if you had to deliver this lesson would you find this a satisfactory way to do it?

◯ Yes, this would be satisfactory

◯ No, this would be unsatisfactory

>>

CHOICE TASK ONE: WHICH LESSON WILL YOU DELIVER?

In the next week, you will be running a lesson in mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on what you are more likely to do:

Set 5 of 8

Features	Lesson A	Lesson B
TASK:	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas
DIRECTIONS:	**You** will **provide** a sequence of **steps** to guide students through the activity	**You** will **provide** a sequence of **steps** to guide students through the activity
COLLABORATION:	Students will **work individually**	Students will **work in groups**
RESOURCES:	Students will combine their learning with **a variety of measuring instruments and materials** to complete task	Students will use only **a few measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **cardboard shapes on a desk**	Students will consider various areas in the form of **cardboard shapes on a desk**
ASSESSMENT:	**You** will **prepare** a **test** for students to complete	**Students design** their own **test** to complete
FOLLOW UP:	Students will present a report **reflecting on the process used and possible improvements**	Students will present a report **describing what they have found**
Which of the two lessons are you most likely to deliver to your students?	◯ Lesson A	◯ Lesson B

Thinking realistically about your most preferred lesson plan you just chose, if you had to deliver this lesson would you find this a satisfactory way to do it?

◯ Yes, this would be satisfactory

◯ No, this would be unsatisfactory

>>

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CHOICE TASK ONE: WHICH LESSON WILL YOU DELIVER?

In the next week, you will be running a lesson in mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on what you are more likely to do:

Set 6 of 8

Features	Lesson A	Lesson B
TASK:	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas
DIRECTIONS:	**You** will **provide** a sequence of **steps** to guide students through the activity	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work in groups**	Students will **work individually**
RESOURCES:	Students will use only **a few measuring instruments and materials** to complete task	Students will combine their learning with **a variety of measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **shapes** on the **Interactive White Board**	Students will consider various areas in the form of **cardboard shapes on a desk**
ASSESSMENT:	**Students design** their own **test** to complete	**Students design** their own **test** to complete
FOLLOW UP:	Students will present a report **reflecting on the process used and possible improvements**	Students will present a report **reflecting on the process used and possible improvements**

Which of the two lessons are you most likely to deliver to your students?	◯ Lesson A	◯ Lesson B

Thinking realistically about your most preferred lesson plan you just chose, if you had to deliver this lesson would you find this a satisfactory way to do it?

◯ Yes, this would be satisfactory

◯ No, this would be unsatisfactory

>>

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CHOICE TASK ONE: WHICH LESSON WILL YOU DELIVER?

In the next week, you will be running a lesson in mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on what you are more likely to do:

Set 7 of 8

Features	Lesson A	Lesson B
TASK:	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas
DIRECTIONS:	**Students** will **generate** their **own questions** to investigate things they need to find out	**You** will **provide** a sequence of **steps** to guide students through the activity
COLLABORATION:	Students will **work individually**	Students will **work individually**
RESOURCES:	Students will use only **a few measuring instruments and materials** to complete task	Students will combine their learning with **a variety of measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **cardboard shapes on a desk**	Students will consider various areas in the form of **cardboard shapes on a desk**
ASSESSMENT:	**Students design** their own **test** to complete	**You** will **prepare** a **test** for students to complete
FOLLOW UP:	Students will present a report **describing what they** have **found**	Students will present a report **describing what they** have **found**
Which of the two lessons are you most likely to deliver to your students?	◯ Lesson A	◯ Lesson B

Thinking realistically about your most preferred lesson plan you just chose, if you had to deliver this lesson would you find this a satisfactory way to do it?

◯ Yes, this would be satisfactory

◯ No, this would be unsatisfactory

>>

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CHOICE TASK ONE: WHICH LESSON WILL YOU DELIVER?

In the next week, you will be running a lesson in mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on what you are more likely to do:

Set 8 of 8

Features	Lesson A	Lesson B
TASK:	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas
DIRECTIONS:	**Students** will **generate** their **own questions** to investigate things they need to find out	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work in groups**	Students will **work in groups**
RESOURCES:	Students will combine their learning with **a variety of measuring instruments and materials** to complete task	Students will use only **a few measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **cardboard shapes on a desk**	Students will consider various areas in the form of **shapes** on the **Interactive White Board**
ASSESSMENT:	**You** will **prepare** a **test** for students to complete	**You** will **prepare** a **test** for students to complete
FOLLOW UP:	Students will present a report **describing what they** have **found**	Students will present a report **reflecting on** the **process used and possible improvements**
Which of the two lessons are you most likely to deliver to your students?	◯ Lesson A	◯ Lesson B

Thinking realistically about your most preferred lesson plan you just chose, if you had to deliver this lesson would you find this a satisfactory way to do it?

◯ Yes, this would be satisfactory

◯ No, this would be unsatisfactory

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QUESTIONS ABOUT YOU and YOUR TEACHING

In a moment we are going to ask you a series of questions about you and the school where you teach. These will help us understand how things like school size need to be taken into account when advising others in the education community about interpreting our results.

Your answers will be kept confidential and cannot be used to identify you personally. We only ever evaluate such effects at an aggregate level.

If you are currently teaching at several schools, please respond to these questions with reference to the school at which you spend the most time. If you are currently not teaching at all, please respond to these questions with reference to the school at which you last taught.

Please click ">>" to continue

<< >>

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What is the highest non-school qualification you have?

- Postgraduate Degree or equivalent
- Graduate Diploma or Graduate Certificate from university or equivalent
- Bachelor Degree or equivalent
- Diploma of teaching
- None of the above

What is the main type of internet connection that you have at home?

- Mobile Broadband
- Broadband
- Dial-up
- Other type of internet connection
- No internet connection

<< >>

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What are your plans in terms of teaching in the next 12 months?

- I am planning to remain in the profession
- I am considering leaving the profession due to family reasons (e.g., having a baby; caring for parent)
- I am considering leaving the profession due to employment reasons (e.g., stress; income)
- I am planning on leaving for reasons other than those above

Please select the type of school where you teach.

- State
- Independent religious
- Independent secular
- Catholic systemic

<< >>

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Where is the school located?

- In a large metropolitan region
- In a large rural city or region
- In a small rural region

How many students are enrolled in this school?

- 25 or less students
- 26 to 112 students
- 113 to 159 students
- 160 to 240 students
- 241 to 300 students
- 301 to 420 students
- 421 to 450 students
- 451 to 515 students
- 516 to 700 students
- 701 to 1015 students
- 1016 to 1050 students
- More than 1050 students

Do you have any students that you must attend to with considerable learning disabilities:

- Yes, it takes up the majority of my time
- Yes, but it is one or a few students among many
- No

<< >>

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CHOICE TASK TWO: WHICH LESSON WILL IMPACT STUDENTS LEARNING?

In the next week, you will be running a lesson in the mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on:

1. Which of the two lessons will be easier for you to prepare?
2. Which of the two lessons is more likely to improve student learning outcomes?
3. Which of the two lessons will the students enjoy more?

Set 1 of 8

Features	Lesson A	Lesson B
TASK:	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas
DIRECTIONS:	**Students** will **generate** their **own questions** to investigate things they need to find out	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work in groups**	Students will **work in groups**
RESOURCES:	Students will combine their learning with **a variety of measuring instruments and materials** to complete task	Students will use only **a few measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **cardboard shapes on a desk**	Students will consider various areas in the form of **shapes** on the **Interactive White Board**
ASSESSMENT:	**You** will **prepare** a **test** for students to complete	**You** will **prepare** a **test** for students to complete
FOLLOW UP:	Students will present a report **describing what they** have **found**	Students will present a report **reflecting on** the **process used and possible improvements**

Which of the two lessons:

1. Will be easier for you to prepare?	○ Lesson A	○ Lesson B
2. Is more likely to improve student learning outcomes?	○ Lesson A	○ Lesson B
3. Will the students enjoy more?	○ Lesson A	○ Lesson B

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CHOICE TASK TWO: WHICH LESSON WILL IMPACT STUDENTS LEARNING?

In the next week, you will be running a lesson in the mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on:

1. Which of the two lessons will be easier for you to prepare?
2. Which of the two lessons is more likely to improve student learning outcomes?
3. Which of the two lessons will the students enjoy more?

Set 2 of 8

Features	Lesson A	Lesson B
TASK:	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas
DIRECTIONS:	**You** will **provide** a sequence of **steps** to guide students through the activity	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work individually**	Students will **work in groups**
RESOURCES:	Students will use only **a few measuring instruments and materials** to complete task	Students will use only **a few measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **cardboard shapes on a desk**	Students will consider various areas in the form of **cardboard shapes on a desk**
ASSESSMENT:	**Students design** their own **test** to complete	**You** will **prepare** a **test** for students to complete
FOLLOW UP:	Students will present a report **reflecting on the process used and possible improvements**	Students will present a report **reflecting on the process used and possible improvements**

Which of the two lessons:

1. Will be easier for you to prepare?	○ Lesson A	○ Lesson B
2. Is more likely to improve student learning outcomes?	○ Lesson A	○ Lesson B
3. Will the students enjoy more?	○ Lesson A	○ Lesson B

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CHOICE TASK TWO: WHICH LESSON WILL IMPACT STUDENTS LEARNING?

In the next week, you will be running a lesson in the mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on:

1. Which of the two lessons will be easier for you to prepare?
2. Which of the two lessons is more likely to improve student learning outcomes?
3. Which of the two lessons will the students enjoy more?

Set 3 of 8

Features	Lesson A	Lesson B
TASK:	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas
DIRECTIONS:	**Students** will **generate** their **own questions** to investigate things they need to find out	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work individually**	Students will **work in groups**
RESOURCES:	Students will use only **a few measuring instruments and materials** to complete task	Students will combine their learning with **a variety of measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **shapes** on the **Interactive White Board**	Students will consider various areas in the form of **shapes** on the **Interactive White Board**
ASSESSMENT:	**You** will **prepare** a **test** for students to complete	**You** will **prepare** a **test** for students to complete
FOLLOW UP:	Students will present a report **reflecting on** the **process used and possible improvements**	Students will present a report **describing what they** have **found**

Which of the two lessons:

1. Will be easier for you to prepare?	◯ Lesson A	◯ Lesson B
2. Is more likely to improve student learning outcomes?	◯ Lesson A	◯ Lesson B
3. Will the students enjoy more?	◯ Lesson A	◯ Lesson B

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CHOICE TASK TWO: WHICH LESSON WILL IMPACT STUDENTS LEARNING?

In the next week, you will be running a lesson in the mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on:

1. Which of the two lessons will be easier for you to prepare?
2. Which of the two lessons is more likely to improve student learning outcomes?
3. Which of the two lessons will the students enjoy more?

Set 4 of 8

Features	Lesson A	Lesson B
TASK:	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas
DIRECTIONS:	**Students** will **generate** their **own questions** to investigate things they need to find out	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work individually**	Students will **work individually**
RESOURCES:	Students will combine their learning with **a variety of measuring instruments and materials** to complete task	Students will combine their learning with **a variety of measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **cardboard shapes on a desk**	Students will consider various areas in the form of **cardboard shapes on a desk**
ASSESSMENT:	**You** will **prepare** a **test** for students to complete	**Students design** their own **test** to complete
FOLLOW UP:	Students will present a report **describing what they** have **found**	Students will present a report **reflecting on** the **process used and possible improvements**

Which of the two lessons:

1. Will be easier for you to prepare?	○ Lesson A	○ Lesson B
2. Is more likely to improve student learning outcomes?	○ Lesson A	○ Lesson B
3. Will the students enjoy more?	○ Lesson A	○ Lesson B

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CHOICE TASK TWO: WHICH LESSON WILL IMPACT STUDENTS LEARNING?

In the next week, you will be running a lesson in the mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on:

1. Which of the two lessons will be easier for you to prepare?
2. Which of the two lessons is more likely to improve student learning outcomes?
3. Which of the two lessons will the students enjoy more?

Set 5 of 8

Features	Lesson A	Lesson B
TASK:	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas
DIRECTIONS:	**You** will **provide** a sequence of **steps** to guide students through the activity	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work in groups**	Students will **work in groups**
RESOURCES:	Students will combine their learning with **a variety of measuring instruments and materials** to complete task	Students will combine their learning with **a variety of measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **shapes** on the **Interactive White Board**	Students will consider various areas in the form of **shapes** on the **Interactive White Board**
ASSESSMENT:	**Students design** their own **test** to complete	**You** will **prepare** a **test** for students to complete
FOLLOW UP:	Students will present a report **describing what they** have **found**	Students will present a report **describing what they** have **found**

Which of the two lessons:

1. Will be easier for you to prepare?	◯ Lesson A	◯ Lesson B
2. Is more likely to improve student learning outcomes?	◯ Lesson A	◯ Lesson B
3. Will the students enjoy more?	◯ Lesson A	◯ Lesson B

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CHOICE TASK TWO: WHICH LESSON WILL IMPACT STUDENTS LEARNING?

In the next week, you will be running a lesson in the mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on:

1. Which of the two lessons will be easier for you to prepare?
2. Which of the two lessons is more likely to improve student learning outcomes?
3. Which of the two lessons will the students enjoy more?

Set 6 of 8

Features	Lesson A	Lesson B
TASK:	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas
DIRECTIONS:	**Students** will **generate** their **own questions** to investigate things they need to find out	**You** will **provide** a sequence of **steps** to guide students through the activity
COLLABORATION:	Students will **work in groups**	Students will **work in groups**
RESOURCES:	Students will use only **a few measuring instruments and materials** to complete task	Students will use only **a few measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **shapes** on the **Interactive White Board**	Students will consider various areas in the form of **cardboard shapes on a desk**
ASSESSMENT:	**Students design** their own **test** to complete	**Students design** their own **test** to complete
FOLLOW UP:	Students will present a report **describing what they** have **found**	Students will present a report **describing what they** have **found**

Which of the two lessons:

1. Will be easier for you to prepare?	◯ Lesson A	◯ Lesson B
2. Is more likely to improve student learning outcomes?	◯ Lesson A	◯ Lesson B
3. Will the students enjoy more?	◯ Lesson A	◯ Lesson B

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CHOICE TASK TWO: WHICH LESSON WILL IMPACT STUDENTS LEARNING?

In the next week, you will be running a lesson in the mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on:

1. Which of the two lessons will be easier for you to prepare?
2. Which of the two lessons is more likely to improve student learning outcomes?
3. Which of the two lessons will the students enjoy more?

Set 7 of 8

Features	Lesson A	Lesson B
TASK:	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas	Predict the number of small **rectangles** that will fit **in a large shape** by calculating areas
DIRECTIONS:	**You** will **provide** a sequence of **steps** to guide students through the activity	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work in groups**	Students will **work individually**
RESOURCES:	Students will use only **a few measuring instruments and materials** to complete task	Students will combine their learning with **a variety of measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **cardboard shapes on a desk**	Students will consider various areas in the form of **shapes** on the **Interactive White Board**
ASSESSMENT:	**Students design** their own **test** to complete	**Students design** their own **test** to complete
FOLLOW UP:	Students will present a report **reflecting on** the **process used and possible improvements**	Students will present a report **reflecting on** the **process used and possible improvements**

Which of the two lessons:

1. Will be easier for you to prepare?	◯ Lesson A	◯ Lesson B
2. Is more likely to improve student learning outcomes?	◯ Lesson A	◯ Lesson B
3. Will the students enjoy more?	◯ Lesson A	◯ Lesson B

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CHOICE TASK TWO: WHICH LESSON WILL IMPACT STUDENTS LEARNING?

In the next week, you will be running a lesson in the mathematics for primary school students. The general topic will be "calculating areas".

Consider the two lesson plans and answer the questions below based on:

1. Which of the two lessons will be easier for you to prepare?
2. Which of the two lessons is more likely to improve student learning outcomes?
3. Which of the two lessons will the students enjoy more?

Set 8 of 8

Features	Lesson A	Lesson B
TASK:	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas	Work out how many **stalls** you can have **at your school fete** by calculating stall and playground areas
DIRECTIONS:	**Students** will **generate** their **own questions** to investigate things they need to find out	**Students** will **generate** their **own questions** to investigate things they need to find out
COLLABORATION:	Students will **work in groups**	Students will **work individually**
RESOURCES:	Students will use only **a few measuring instruments and materials** to complete task	Students will use only **a few measuring instruments and materials** to complete task
MEDIUM:	Students will consider various areas in the form of **shapes** on the **Interactive White Board**	Students will consider various areas in the form of **shapes** on the **Interactive White Board**
ASSESSMENT:	**You** will **prepare** a **test** for students to complete	**Students design** their own **test** to complete
FOLLOW UP:	Students will present a report **reflecting on** the **process used and possible improvements**	Students will present a report **describing what they** have **found**

Which of the two lessons:

1. Will be easier for you to prepare?	◯ Lesson A	◯ Lesson B
2. Is more likely to improve student learning outcomes?	◯ Lesson A	◯ Lesson B
3. Will the students enjoy more?	◯ Lesson A	◯ Lesson B

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I use an IWB as part of my lessons

- Never
- Rarely
- Primarily as a starter activity
- Throughout the whole lesson

I would characterise my experience with IWBs as

- Introductory
- Intermediate
- Advanced
- None

My access to an IWB is best described by...

- An IWB is in my classroom
- An IWB can be brought in if I book it
- I can use an IWB if I book the classroom where it is installed
- I don't have access to an IWB
- I have never seen an IWB used

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Challenges I experience with IWBs are

	Yes	No
Writing notes on the IWB		
Only able to have one person use the IWB at a time		
Getting access to an IWB because it is in a shared room or is shared between rooms		
Naming, saving, and organising files		

I frequently use the following applications or tools on the IWB

	Yes	No
Microsoft PowerPoint		
Video playback		
Video conferencing		
As a whiteboard for drawing, notes, etc.		
Games and other activities made possible by board		
Prepared lessons		
Smart resources		
Connection to Internet		
Smart Notebook		
Other		

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Please select your estimate for the number of IWBs in your school

- ◯ less than 5
- ◯ 5 - 10
- ◯ 11 - 15
- ◯ 16 - 20
- ◯ 21 - 25
- ◯ 26 - 30
- ◯ 31 - 35
- ◯ 36 - 40
- ◯ 41 - 45
- ◯ 46 - 50
- ◯ 51 - 60
- ◯ 61 - 70
- ◯ 71 - 80
- ◯ 81 - 90
- ◯ 91 - 100
- ◯ 101 - 125

Please select the location where you do the majority of your lesson preparation

- ◯ School
- ◯ Home
- ◯ About evenly split between school and home
- ◯ Other location (please specify) ________

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Please indicate whether you agree or disagree with each statement:

	Agree	Disagree
I generally use an IWB as part of my lessons	○	○
I use IWBs because it helps students learn more	○	○
Changing my lesson plans to incorporate the new technology would take more time than I have	○	○
My class is more interactive now that we have an IWB	○	○
I am always looking for new ways for students to interact with the technology	○	○
I use IWBs because it improves student learning	○	○
I use IWBs because it helps me to be more organized	○	○
I use IWBs because the students enjoy the lessons more	○	○
Students share more ideas and ask more questions now that we have an IWB	○	○
I use IWBs during classroom discussions	○	○
I tend to use IWBs more when I find resources other have created	○	○
The IWB gets in the way of other things I want to do	○	○
I don't really see a need for IWBs	○	○
It is a significant inconvenience to redo my lesson plans for use with an IWB	○	○
In terms of using the IWB, I can adapt lesson plans from others	○	○
An IWB is a regular feature in my classroom	○	○
I use IWBs because students expect it	○	○
I would prefer to use a regular whiteboard	○	○

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This concludes the survey. Thank you very much for your valuable time and feedback.

Please click on " >> " to claim your points.

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