Running before you can walk: blended learning in collaborative spaces

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Structured abstract

BACKGROUND
Many universities across Australia are undertaking significant works to upgrade online and face-to-face teaching technologies and campus environments. The University of Technology, Sydney is one of these institutions and, in 2014, the faculty of engineering and IT will occupy a new complex featuring a range of interactive and collaborative learning spaces. There is a growing body of literature evaluating the delivery of courses using online learning environments and collaborative learning spaces (eg Radcliffe et al, 2009, Rasmussen et al 2012) and it has been found for example that a large cohort of first year engineering students positively engaged in collaborative spaces and preferred them over conventional lectures (Rasmussen et al 2012). This paper introduces the review of a senior engineering subject delivered in intensive Block mode sessions as a case study for analysing student engagement and experience of interaction using new collaborative learning spaces.

PURPOSE
To determine what has been the student and staff experience of using new interactive learning spaces in combination with the current online learning system for this subject and which teaching strategies have been successful for subject delivery in this context. What improvements might be made in the design of future learning spaces and in the approach to optimising their use by teaching/facilitator teams?

DESIGN/METHOD
Through a post delivery review of the subject this paper assesses and evaluates the learning experience of students in a block mode subject delivered in new collaborative spaces. It analyses findings from two surveys across a range of indicators.

RESULTS
Results demonstrate that students preferred the interactive learning space over conventional spaces used in other subjects for reasons of ease of interaction with their peers and engagement in the subject. They reported that the Block sessions in these spaces were satisfactory for their induction into themes and objectives of the subject, but less so for understanding subject requirements and that certain features of the design of the space pose difficulties for engaging in a large group ie for this space there is a limit to its 'flexibility'. These findings have led the teaching team to include more structured group interaction which explores the rationale for assessment projects and their criteria.

CONCLUSIONS
the introduction of new collaborative learning spaces on a large scale in engineering enables teaching teams to be freed from having to 'shoehorn' group learning approaches into poorly fitting theatres and classrooms. Post delivery review of the use of pilot spaces and the quality of student experience of them in combination with new approaches integrated with the online learning environment, can support and inform the transition to wider use of these spaces and innovation in teaching approaches in engineering. This is no small project in a field which has been characterised by an intensive lecture-based model of teaching and learning and so stakeholders need to be 'enrolled' in its objectives and how they can be aligned with their priorities, and development resourced to ensure success.

KEYWORDS
Collaboration, interactive, learning

Introduction

This paper considers the use of a new interactive learning environment for the face-to-face component of a blended learning strategy developed for the senior undergraduate subject Interrogating Technology. We consider the experience of using these learning environments so as to contribute to the debate around the educational effectiveness of these spaces and teaching approaches best suited to them. In 2013 the face-to-face sessions in this blended block mode subject were delivered for the first time in a new collaborative learning space, with the remainder of the subject being conducted in the existing online learning environment. A survey of student experience was taken at the conclusion of the semester and the results are discussed here. We are seeking to better understand how to effectively use these new learning facilities from the staff and student experience using these spaces for active face-to-face learning in combination with online resources.   As identified by Rasmussen, Dawes, Hargreaves and James (2012), the change in pedagogy and teaching approach required to effectively utilise these spaces, requires much more work including,

> significant change of practice, staff development, space change and research and analysis, to challenge and change some long held norms.

On the basis of research and the findings of a 2008 Colloquium (Tibbetts 2008) Radcliffe et al frame these changes as a focus on pedagogy, space and technology (PST) relationships (2009). This study contributes to developing a better understanding of these required changes in practice and how these PST relationships are managed. This is in the context of the roll-out of a number of these spaces in a new dedicated engineering and IT faculty building underway at the University of Technology, Sydney for occupancy in 2014.

Project Overview

Through a post delivery review, this paper assesses the experience of intensive face-to-face block sessions held in pilot collaborative learning spaces. We evaluate subject delivery strategies in a senior engineering subject to identify improvements that could be made in the design of future interactive learning environments and in the use of these new interactive classroom facilities that will feature in the new Broadway building opening in 2014.

The key question of this research is: how effective was the use of a new collaborative space in combination with the current online learning system for student learning outcomes in a senior engineering subject focused on literacy in social theory, policy development and stakeholder and community consultation?

This has been considered by reviewing and evaluating the subject, answering the following questions.
a)   What has been the student and staff experience of using the new interactive learning spaces in this subject?
b)   What teaching strategies were successful for the subject delivery in this context?
c)   What improvements might be made in the design of future learning spaces?

Background

The senior undergraduate engineering subject Interrogating Technology, introduces students to a range of theoretical positions for analysing processes of technology decision-making and development across a range of engineering disciplines. Students are introduced to community and stakeholder consultation processes and approaches to policy development. It is a subject with a significant reading load and requires students to post entries in a reflective learning blog throughout the semester and to complete two major assessment tasks - one group, and one individual, in report format. The subject is designed to improve student literacy and focuses on learning from controversy and critique and textual analysis by contrast with much of the engineering curriculum. The enrolment is 60-100 students from the Information & Communications Technology, Civil and Civil and Environmental Engineering majors. The subject was selected for update as it is delivered in a blended block mode via

two days of face-to-face meetings and an online learning environment. A range of updated course materials were delivered in different forms, such as online video, e-texts, hard-copy texts, face-to-face lectures and through structured research activities carried out during block sessions in a collaborative learning space.

Interactive Learning Spaces at University of Technology, Sydney

The University of Technology in Sydney like many Australian universities is investing significant resources in the development of new interactive learning spaces. These spaces feature movable chairs, tables and multiple computers connected to multiple large interactive screens. Using motion-tracking technologies, these screens can be drawn to and outcomes saved as files. Students and staff are also able to network their own devices to these facilities to enable collaborative work in small groups. These types of spaces are also referred to variously as 'next generation learning spaces' and 'advanced networking laboratories' (Klimovski, Cricenti, But, 2011). Increasingly educators and academics will be required to use these spaces instead of traditional classrooms.

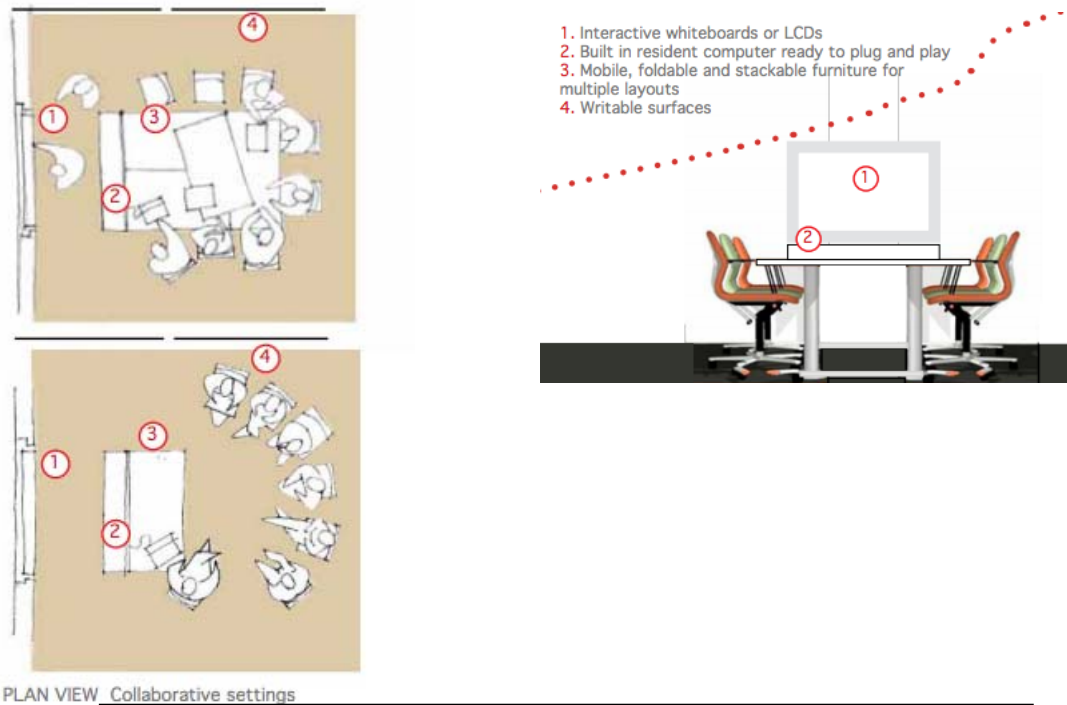The appearance and layout of these spaces is shown below:

1. Interactive whiteboards or LCDs
2. Built in resident computer ready to plug and play
3. Mobile, foldable and stackable furniture for multiple layouts
4. Writable surfaces

PLAN VIEW Collaborative settings

Figure 1: Layout and appearance of new interactive learning spaces at the University of Technology Source: Future Spaces Now, 2012

A new collaborative space was used for the delivery of the face-to-face component of the Interrogating Technology subject over two whole day block sessions through the semester. These two blocks comprised multiple sessions - introducing the subject and its objectives, exploring its themes and previewing assessments via diverse formats including short lectures, tutorial activities in discussion groups of approximately 20 people and small group activities in groups of 5-6 and 2-3. Tutorial activities and discussions were designed to be 'active learning sessions', where students were encouraged to cooperate, collaborate and actively engage with each other to undertake and report back on specific tasks (Buskes et al. 2009). A range of authors confirm the efficacy of tutorial activities that incorporate active and collaborative learning (Willey & Gardner 2010; Buskes et al. 2009 and Smith et al. 2005).

Key Course Activities in Subject Blocks

Block sessions were designed to introduce students to the themes of the subject, to encourage discussion of these themes and engage students in activities that explore, and serve to preview assessment tasks. The following sessions were designed and carried out during these two block days.

- Presentations by teaching staff on topics such as course requirements and course themes such as a critical perspective on technology, sustainability and social change, community consultation and policy-making. These presentations were carried out as one large group of approximately 70-80 people.
- Short sessions on: research strategy from a library staffer and academic writing from student learning support; and community consultation on energy infrastructure by an environmental lawyer, and a review of community owned renewable energy schemes by an engineering entrepreneur.
- Tutorial group activities and discussion. These sessions were carried out in three groups of 15-20 students.
- Small group collaborative activities in groups of 3-4. These activities were designed to be linked to the requirements of assessment tasks due later in the semester, and to serve as a 'preview' for the upcoming assessment. An example of this is in Block 2, where students were required to have prepared a draft topic for their learning contract, and to present 3 slides for a 'sprint' overview of potential topics to a group of 10 for structured feedback. Tasks such as these are what Smith et al. (2005) refers to as 'collaborative learning' tasks incorporating a pedagogical strategy where students work in small groups and are accountable to their group to intellectually and substantively engage with course content. These tasks were designed to be student run and to generate peer feedback. As such, the teaching team did not 'access' the feedback loop between students and peers - with some disadvantages that became evident in feedback.

The new flexible collaborative learning space in 2013 allowed the teaching team to transition readily between the large group orientation to the subject for 70 (space capacity of 90), tutorial groups of 25 and smaller groups of 10 and 4. This contrasted significantly with the previous experience of moving several times through the day-long Block between lecture theatres, and co-located flat rooms for tutorials and small group activities. It also avoided the previous unhappy compromise of accommodating 2/3 of the cohort in one room when there were no alternatives. As a consequence of this flexibility, the Blocks were less logistically demanding for the teaching team. Students confirmed the space used for Blocks to be "relaxed and comfortable. (whereas) Often in other lectures it seems very cramped."

The tutorial activities were also redesigned to encourage students to expand their research and engagement with virtual space with a particular focus on the online subject learning environment, online university resources and collaborative tools such as wikis. Traditional classrooms used for teaching this subject prior to this study, did not formally allow for a collaborative engagement with virtual space in the classroom (Oblinger 2005).
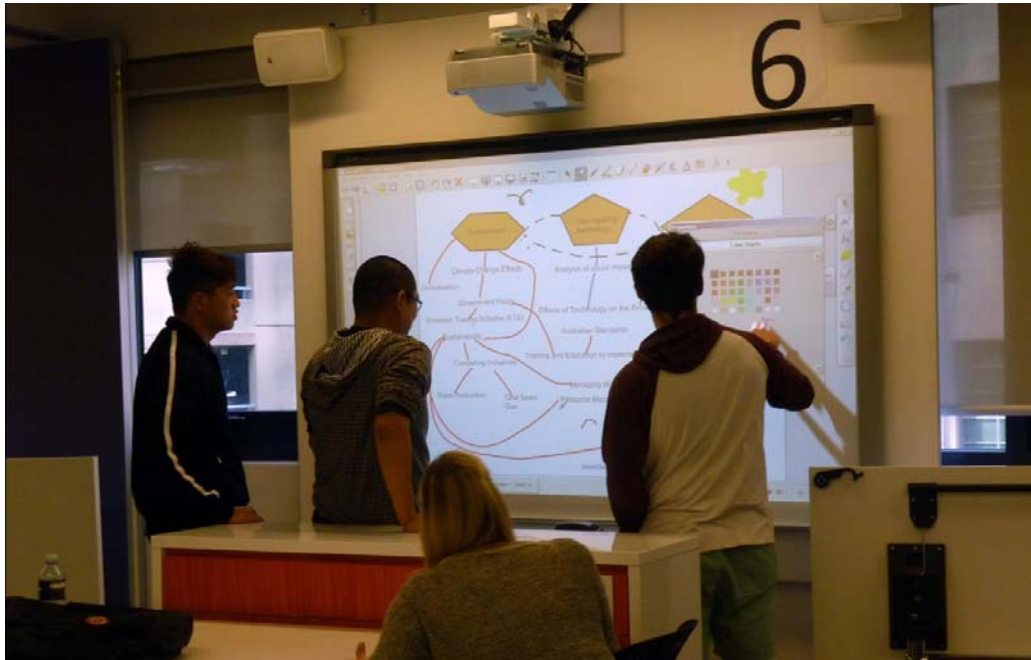
Figures 2 & 3: New Interactive Learning spaces in use during Block Sessions.

Methodology

Though a post delivery review, this paper reports on the experience of using interactive classrooms by staff and assesses and evaluates student learning experience through a range of indicators including reported student engagement with various resources, and academic outcomes. These indicators were assessed at the conclusion of this subject in several ways. A student survey specifically designed to collect data on the experience of both the block mode sessions held in pilot collaborative learning spaces and within the existing online learning environment was conducted at the conclusion of the subject. This survey was designed with the following goals:

- To gauge the students learning experience and perception of the new learning spaces.

- To better understand if the block learning sessions were perceived as valuable for student learning
- To better understand what course resources students used and how these were accessed (not included in this discussion)
- To better understand any persistent issues or obstacles for student learning in the subject.

Forty student responses to this survey have been considered here. The outcomes are useful for academic staff who are under pressure to update existing subjects using 'blended' face to face and online learning approaches and to redesign subjects for delivery in new collaborative learning spaces.

Findings

Staff reflections on interactive learning spaces

As pilot interactive learning spaces at the University of Technology, Sydney have only been fully commissioned for one semester, a comprehensive evaluation and assessment of the effectiveness of these spaces will be conducted.

Radcliffe et al report from a colloquium of teaching and learning space experts that there was support for evaluation to be an integral part of the process from design (of new learning spaces) to post-occupation through a Pedagogy, Space, Technology (PST) Framework (2009 p.27). In this example, the teaching team has found that access to an interactive learning space integrating shared technology has helped to transform many aspects of the block mode teaching sessions, including organisation, student interaction and collaboration at different levels of scale and orientation to learning in the subject.

In tutorials and active learning sessions, the learning space was subdivided into three smaller spaces for tutorial work via movable partitions. Within these three smaller spaces, the multiple screens and computers offered easy access to online resources for small student groups of 3 or 4. Students were also able to navigate the Internet, library website and course website enabling them to begin researching and negotiating group assessment task topics. The divided room layout also prompted group discussion, collaboration and the large screens meant all members of the group were able to review relevant materials, all of which are conducive to a collaborative learning experience.

There were also found to be limitations. When the interactive learning space was reconfigured for lecture presentations and students were addressed as one group, the room acoustics made the speaker difficult to hear at times. The multiple screens in this context also meant that groups of students were orientated in various directions making it difficult for the speaker to maintain eye contact across the whole student group. From a technical point of view, the subject teaching team relied on guidance from an IT support staff member to make optimal use of the space. During the block sessions it was necessary to spend significant time ensuring that the audio-visual system across multiple screens and computers was configured to suit both lecture and tutorial formats. Throughout both block sessions, several of the screens' audio facilities also malfunctioned, showing how technical failure in a complex system set up can use valuable time, and confirming the need for flexibility.

Significant training and support is needed for staff to not only be able to plan sessions and operate these facilities, but also to be able to troubleshoot technical issues as they inevitably arise. This aligns with Oblinger's emphasis that one of the most important design considerations is making learning spaces flexible, comfortable, secure and functional, whilst accommodating information technology (2005).

Student reflections on interactive learning spaces

In response to the question:

Describe your experience of the learning space in this subject in comparison with your classrooms for other subjects.

Students reported similar advantages to those reported by staff:
- *The learning space layout was helpful in interacting with fellow students more easily. The seating arrangements encouraged group work.*
- *Compared to other class rooms for tutorials and even lectures, it had a much more relaxed and easy feel.*
- *It was more interactive and engaging than my other subjects previously undertaken. It also help (sic) me improve on my interactive and communications skills.*
- *It was a really good space for the workshops and open group discussion.*
- *The open space learning was good, the availability of services like computers and white boards was outstanding*
- *I thought it was a great open space that sparked discussions among students. It also had great resources for online researching etc.*

And the following negative experiences:
- *Over the top with smart boards… Also cold and uninviting environment with the concrete flooring*
- *In my opinion, the room may not suitable for a large group of students. The layout of room seems like isolate (sic) the students who sit in the other sides causes inconvenient for me to listen speaker's speech.*
- *individual (student) presentation lost power because of the noise of the other presentations.*
- *Plenty of room. Strange technical issues with the installed computers.*

Students were also asked to assess if the block sessions were useful for understanding subject themes, objects or requirements and reported the following using the following four-level scale:
1- Essential
2- Very useful
3- Somewhat useful
4- Not at all useful

Table 1: Student Feedback on Block sessions

The block sessions were useful for my learning and understanding of the:				
	Essential	Very useful	Somewhat useful	Not at all useful
Subject themes:	34.8% (8)	26.1% (6)	39.1% (9)	0.0% (0)
Subject objectives (eg. critical thinking, literacy in subject themes, research skills):	41.4% (12)	55.2% (16)	0.0% (0)	3.4% (1)
Subject requirements:	17.2% (5)	27.6% (8)	55.2% (16)	0.0% (0)

Students reported that the block sessions were very useful for understanding the themes and objectives of the subject but were not as useful for understanding subject requirements.

General findings and discussion

Overall, student feedback regarding the use of the interactive learning spaces was positive, however this study is limited by the small sample size (40 students) of the survey.

Our study found that the interactive classrooms invigorated 'active learning sessions' where students were required to collaborate and apply their knowledge and understanding to particular tasks in small groups. However, students and staff both found that the interactive classroom spaces were difficult to configure for the comfortable delivery of lectures and presentations to an audience of over 30 students. Both staff and students reported the acoustics and arrangement of screens and seating made it difficult to address, and to be engaged, in a large group.

Reflection on teaching strategies, specific student tasks and pedagogy

Both staff and students reported that the facilities available in the interactive classroom spaces improved engagement and collaboration between students in small group exercises.

In reflecting on peer review activities where students presented proposed research topics to small groups for constructive feedback, a risk was uncovered which can be addressed by small group inquiry and collaboration. Students who were still unfamiliar with the scope and opportunities of the major project discouraged topics that may have qualified as interesting and worthwhile subjects of investigation. This is an opportunity to facilitate group investigation of the specification for assessment projects and the link to learning outcomes. Increased opportunities for flexible interaction and group inquiry can resolve the tension that students report between the freedom of topic choice and the specified requirements for achieving learning objectives for the task in a block mode subject.

By the provision of well-equipped collaborative teaching spaces that allow ready transition between levels of scale in an intensive block teaching mode, it has been possible to concentrate more effort on staged group activities that explore interdisciplinary inquiry and the *rationale* for different assessment tasks. Since the time of this study, it is now also possible to use mindmapping software built into whiteboards to better orient students to the subject, and also to strengthen activities demanding timely qualitative feedback from peers.

Future improvements for interactive learning spaces

The experience of staff and students of pilot interactive learning spaces is a resource for refining the design, implementation and successful roll-out of such new learning 'assets' in the university. From the experience documented here, priority does need to be given to design considerations such as lighting controls, audio facility, and acoustics. There needs to be a ready information and support package for inducting staff into the optimal use of such spaces for their diverse purposes. Exchange with prospective users can explore the potential of interactive technologies to support collaboration and desired learning outcomes and 'workaround' the risk that complexity might mean failures and disruption.

Institutional approaches to new paradigm for teaching and learning

The project to intensively promote and disseminate collaborative teaching and learning practice to accompany the launch of new purpose designed collaborative learning spaces at UTS has prompted significant discussion amongst staff about current servicing and infrastructure. Staff are required to adapt and to be able to exploit the opportunities and potential of new learning spaces and facilities. These changes also need to be guided by a pragmatic approach to interactive technologies and supporting learning systems to enhance communications between students and their peers and their facilitator teachers.

Further research directions

The evaluation of the use of the pilot learning spaces should make it possible to incorporate the experience and insights of staff and students into the design and implementation and roll-out of new spaces in the campus-wide building program at UTS. This scale of project confronts the challenges of 'enrolling' stakeholders and motivating their support and participation in the 'translation' of innovation into particular settings. It is a valuable 'live' case study for senior students of engineering - who are also members of its target constituency.

Conclusions

It is hoped that through reviews such as this, the university is able to roll out new interactive learning spaces and build staff capacity to exploit them, informed by the experience of using pilot spaces as reported in this case study. It is important to gain a nuanced understanding of the shared experience of these new spaces and collaborative approaches, and how they can be best resolved to build confidence - and grow the capacity and motivation for lifelong learning.

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