

Staff and student perceptions of the effective use of contemporary lecture theatre technology

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Abstract: *With increasing class sizes, even the most traditional Australian Universities have invested heavily in modern lecture theatres that are now equipped with the latest multimedia, conferencing, recording, networking and online facilities. These wired systems also provide opportunities for the seamless integration of portable devices that can assist the presenter in communicating with the class. More importantly there is compelling evidence that the inclusivity of this new 'post PowerPoint' generation of communication tools can offer significant pedagogical advantages when used effectively. Having made the investment, the universities obviously advocate the use of such technology and in some cases insist upon it. However, amidst the growing teaching and research performance expectations, the question arises as to whether or not these tools are being broadly adopted to their full pedagogical potential. Are staff able to find the time in which to develop the newly required skills and is the necessary training available? Two pilot studies (one canvassing the perceptions of the students and another staff) were therefore conducted to establish if academics are adopting this contemporary technology in favour of traditional 'chalk and talk', and whether or not those that are making an attempt are actually doing so effectively. The aim of this paper is not simply to determine the effectiveness of these new technologies in the lecture theatre, because in many cases this has already been demonstrated; but to present the preliminary findings of a pilot study that indicate the inclusivity and popularity of these contemporary lecture theatre tools amongst academics and to determine whether, broadly, students believe staff are using them effectively.*

Introduction

Those now fortunate enough to reflect back upon a long career in academia would observe how technology has significantly changed the way in which we teach. Whiteboards are now more commonplace than blackboards and multimedia projectors showing Microsoft *PowerPoint*© presentations have replaced 35mm slide projectors. Eventually, many of the changes become forced upon academics as the more out-dated technologies completely disappear from the lecture theatre. This gradual disappearance is continual with a recent memo at The University of Adelaide (UoA) advising that VHS video systems will no longer be replaced once in need of repair.

While the whiteboard still has its place in the classroom, Microsoft *PowerPoint* and its associated hardware have clearly taken centre stage (Savoy et al., 2009). It is evident that engineering lecturers (in the majority) and their students have clearly accepted and warmed to *PowerPoint* since it was first introduced to the world in 1987 (Kogent, 2008). While this popular piece of software still draws significant attention from critics and aficionados alike, when used *sensibly*, it provides the lecturer with the opportunity to clearly present their work in a variety of written, graphical and visual formats (Craig and Amenic, 2006). Recognising the importance of student engagement in lectures (Kestell, 2006), most modern theatre systems now comprise of a built in, *PowerPoint* capable, fully networked, conference capable computer; connected to a data projector, which is most probably complemented by a DVD or Blu-ray player, a document camera and a high quality audio system. These systems also permit the integration of laptops, tablets, iPads, smartphones and a variety of portable devices that can assist with student interaction and engagement.

However, even though universities have demonstrated a willingness to invest in this expensive technology, Jones (2009) suggests that the use of this modern equipment can still be perceived as radical, high risk and is consequently in danger of being used minimally and inappropriately. Following anecdotal evidence that this is the situation at UoA, this paper presents the preliminary findings from a pilot study on the use of contemporary technology in the lecture theatre; presenting both the students' and the academic staff perspectives.

Contemporary Lecture Theatre Technology

The benefits of modern teaching tools have been the subjects of numerous studies, with many examples from innovative champions of technology, demonstrating how effectively it can be when put to good use and managed properly and enthusiastically. For some, these new technologies are seen as providing opportunities to totally

redefine the lecture theatre and the methods in which we communicate with our students (Willis, 2009, Greig 2009 and Greig 2010).

Podcasting and Screencasting is one such method and generally refers to the electronic delivery of multimedia content by file for on-demand playback. These files are not limited to any specific content but include recorded lectures, thus allowing the material to be accessed multiple times (Sawyer, 2010). This is now a user-friendly technology, executed in its most simple form by the press of a button as a lecture commences, and once more upon completion. While this can provide a safety net when face to face (f2f) lectures are unavoidably missed, many academics fear that this practice has a detrimental effect upon lecture attendance, and hence the learning objectives of the course (McCredden and Baldock, 2009). However, evidence contradictorily suggests that students who watch these recordings still attend f2f sessions and do not generally see recordings as a lecture alternative (Copely, 2007). More importantly, Golberg et al. (2006) conclude that if the curricula of a course is delivered electronically, via a podcast (or screencast), the students believe that they have more time to contemplate the information and that the allocated lecture time could be used more interactively and effectively, rather than to simply recite the curricula. They also found that most students watched or listened to these on a home computer, rather than on a personal portable player, thus providing a tool by which students can simultaneously conduct broader and deeper online research into the subject being presented, while also discussing the content with their peers via social networking.

Consequently, screencasting can be used as a mechanism to more effectively prepare students for, and therefore transform, the f2f session. By presenting key concepts prior to the f2f, the passive didactic lecture can be changed into an interactive workshop atmosphere where students can actively practice their problem solving skills (Willis, 2009). Pope et al (2009) used interactive Flash© presentations to improve student outcomes by encouraging pre-lecture engagement, with subsequent student feedback via multiple choice questions (MCQ) that also offer formative assessment. Using such teaching and learning strategies builds student confidence in the curriculum prior to lectures which creates opportunities for active learning strategies, such as peer instruction (Mazur, 1997) and team based learning (Willison et al, 2010).

Another modern technology showing promise in a lecture theatre setting is the **Audience Response System (ARS)** such as *VotApedia*. In audience response systems, students typically select multiple choice answers from handheld 'clickers', to encourage class participation. Studies have demonstrated that the use of these devices can significantly improve student interest and the learning outcomes in courses (Kaleta and Joosten, 2007). Such systems can have problematic logistical issues arising from the need to distribute and collect the purpose built clickers. One answer to this is variants such as *VotaAedia* that replace the clicker with the students' own mobile phones. Each answer has a corresponding phone number, that when dialled returns an engaged signal while still recording a vote. While the quizzes require an investment of time to set-up and are dependent upon an internet connection in the lecture theatre, this particular system has a fast response time and has demonstrated good results in formative evaluation exercises without significant financial investment (Maier, 2008). An interesting notion from David Jones' blog is the way that *VotApedia* lets the lecture extend beyond the lecture theatre whilst retaining interactivity. Coupling *VotApedia* with a live video stream of the lecture allows anyone, anywhere to interact with the lecture (Jones, 2009). A possible criticism of *VotApedia* is one of equity and student inclusivity: making the assumption that all students own a mobile phone.

The annotation of *PowerPoint* slides, to highlight certain points, or to add supplementary notes can be an effective teaching technique but is cumbersome using the mark-up pen function with a mouse. **Touch screen tablets** (such as iPads or some netbooks) provide a more ergonomic interface to more effectively annotate slides (Goldberg et al., 2009). When combined with screencasting software, it has been used to record the working through of problems (Thompson and Dekkers, 2009). The use of wireless Tablets (being wirelessly linked, lightweight and handheld) can offer new levels of interactive engagement. Its highly portable nature allows the lecturer to move about and to pass the tablet PC to members of the student audience. Students can then communicate ideas, solutions to problems, calculations and the like, by sketching and writing directly on the tablet PC and have their thoughts presented instantaneously upon the projector screens for all to see and engage with. This pedagogy provides a very powerful way of involving the whole class in activities that require them to think (Kestell and Grainger, 2010).

A **visualiser** is a sophisticated document camera that has considerable flexibility in that it can display documents, transparencies, slides or 3D objects on a data projector. The lecturer can interact with these by pointing, annotating and manipulating the subject material. They have been used to vary the presentation style in order to maintain interest by switching between the main thread of a lecture and background material, with student and peer feedback indicating it can play a part in effective teaching (Willis, 2009).

The principle use of **dual projection screens** appears to be for videoconferencing where one shows the audience and the other what the audience is seeing (Synmedia, 2010). Another common use is to allow the principal lecture slides to remain on one screen while the other is used to elaborate particular points.

Electronic (Interactive) whiteboards still seem to be something of a rarity in engineering higher education. An image is projected on the whiteboard from a PC (such as a slide show) and the user can interact with this using the whiteboard surface as an input device to the PC. As such it provides the ability to annotate presentations and to have this recorded, and some are linked to ARS software. The technology appears to be far more popular in schools than universities although with appropriate software available it has been used to support small group collaborative modeling in Systems Engineering (Kolfshoten et al., 2009).

Results from Staff and Student Pilot Studies

Anecdotal evidence from students at a number of networking and student feedback forums implies that new technologies are not being used as widely as perhaps they should be, especially given the evidence discussed above that it can improve the student learning experience, and moreover, where it is being used it is not always being used effectively. The authors therefore decided to conduct two pilot studies (one of academic staff, the other of students) within UoA to establish practices and beliefs amongst staff and students.

Academic Staff

The academic staff pilot study included 21 lecturers who, for a number of years now, have been encouraged to make full use of a comprehensive suite of multimedia and recording facilities that have been rolled out throughout the entire University's lecture theatres. The views of staff on technology tools, their adoption and their effectiveness were sought through the use of a questionnaire, with the results summarised in Table 1.

Table 1 – Summary of academics' responses on the use of technologies in support of lectures

		Very Bad	Bad	Neutral	Good	Very Good	Never used
Votapedia	Impact				1		20
	Ease of use			1			
	Ease of Integration.					1	
Other ARS	Impact				1		20
	Ease of use				1		
	Ease of Integration.					1	
Tablet based annotations	Impact				2		19
	Ease of use				2		
	Ease of Integration.				2		
Video recorded lectures	Impact	1	1	1	4	7	7
	Ease of use		1	1	4	8	
	Ease of Integration.		1	2	4	7	
Podcasting	Impact		1		1	5	14
	Ease of use				1	6	
	Ease of Integration.				1	6	
Screencasting	Impact				3	7	11
	Ease of use				1	9	
	Ease of Integration.				3	7	
Electronic whiteboard	Impact			1	1		19
	Ease of use			2			
	Ease of Integration.			1	1		
Dual projection screens	Impact		1	5	2	2	11
	Ease of use		1	1	4	4	
	Ease of Integration.		1	2	4	3	
Visualisers	Impact			1	9	4	7
	Ease of use			1	5	7	
	Ease of Integration.				6	7	

The most immediately obvious result from the questionnaire was that most staff (approximately two thirds) have never used many technologies such as ARS, tablet based annotations or electronic whiteboards, despite the fact that they are documented as beneficial to pedagogy and the learning environment of a lecture theatre.

Two thirds of the group have recorded lectures, but this has been amidst insistence that they do so. Only half of these report a positive experience with respect to their perception of impact, ease of use, and ease of integration into their existing teaching practices.

Approximately half had made screencasts of either pre-recorded lectures or demonstrations and a third created downloadable podcasts of their work (for use on a portable player). In each case, however, most reported a positive experience in terms of perceived impact, ease of use and ease of integration. Visualisers were used by approximately two thirds of those asked.

Students

The student pilot study comprised a class of 38 final year engineering students who were each provided with a questionnaire asking them to reflect upon their experience of a broad range of technologies that might have been used in support of their lectures. The results from the student pilot study are collated in Table 2.

Only one third of students reported a positive perception (either ‘Good’ or ‘Very Good’) for *VotApedia*, which has been reported to be a very capable and effective tool. From the authors own experiences of this technology it seems likely that its mode of use is crucial to its effectiveness. Most had watched recorded lectures, or seen staff use dual recorded screens and are generally positive about their experiences with them. However the use of dual screens may have confused students, since while many lectures incorporate dual screens, their use often involves the simultaneous projection from a single source. Few have experienced the use of electronic whiteboards, while a majority enjoy the experience of live annotations (made possible through touch screen tablets) during lectures.

Looking at the general trend of the survey results, in many cases students are divided between positive experiences or have never experienced the technology and this demonstrates that when it is used effectively students enjoy these more contemporary methods of engagement. However, some technologies that have demonstrated significant beneficial effects have also recorded very negative responses suggesting that the technologies are not always used to best effect.

Table 2 - summary of students’ responses on the use of technologies in support of lectures

	Very Bad	Bad	Neutral	Good	Very good	Never experienced
Votapedia	5	7	9	9	3	5
Other ARS	1	1	13	11	1	7
Slide annotations	0	1	8	14	13	0
Video recorded lectures	0	0	5	13	18	1
Podcasting	0	1	8	11	9	10
Screencasting	0	0	6	8	10	9
Electronic whiteboard	0	0	10	7	3	15
Dual projection screens	0	1	20	10	5	1
Visualisers	0	0	9	9	7	10

Conclusion

Two issues have been identified from this limited preliminary study. The first is that unless ‘strongly encouraged to do so’ a large percentage of staff resist the use of the broad and varied technologies that are available to them, despite documented evidence that when used effectively they can improve the learning experiences of the students.

The second issue, which becomes far more apparent from the student pilot study, is that these technologies are not being used as inclusively and effectively as they could be, but if they were, they could improve the student learning experience. In some cases there is evidence that potentially positive experiences can become quite negative ones if the technology is used ineffectively. Clearly, these technologies (as supported by the previously cited research) *can* improve the student learning experience, but the precise way in which it is used is crucial for a positive effect. These indications (which should be investigated further through more comprehensive surveys) clearly suggest that it is not sufficient for institutions to invest in hi-tech lecture facilities if their academic staff are not provided opportunities to develop skills in using them. Not just the mechanics of use, but the appropriate means of use, aimed at improving learning outcomes. As Jones (2009) notes: *“I can hear some that this is a job for the IT department. It is the job of the IT department to evaluate new technologies, judge their appropriateness, select the appropriate approach and then implement it effectively. Ahh, no. Such approaches are generally radical, high risk, expensive and tend to be used minimally and usually inappropriately. The important point about any new technology for learning and teaching is how much and how well it is used. Such considerations need much broader consideration and insight than typically held by most IT departments. This is not to suggest that IT departments aren’t knowledgeable about technology. It is to suggest that they typically don’t know much about learning and teaching and getting academics to improve/change their learning and teaching.”*

While these findings warrant a more comprehensive study for a definitive conclusion, there is indication that trailblazing academics who become experts in the use of this technology should be more involved in the education and encouragement of their peers in its use. Furthermore there is indication that while the added functionality is now found in most lecture theatres at a significant financial cost, the use of this very technology can at times detrimentally affect its potential for adding learning value.

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