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Assessing the use and impact of technology in physical learning environments at City University London - Learning Development Associate project

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Abstract

Saying 'technology is here to stay' implies that it is unpacking its bags for the weekend. In reality, technology has already left, and is on its way to its next destination. There is more than a little truth in the notion that only yesterday's gadgets are available in the shops; tomorrow's are in the laboratories or on the (digital) drawing boards.

Technology plays an important role in learning at City University London in both physical and virtual learning environments. This project examines the technology that is used in physical learning environments, and investigates why it is used. Through a series of mini case studies involving observations, interviews and surveys with key stakeholders, this study attempts to gauge the impact technology has on teaching and learning.

In general the data indicates that technology is popular with both teachers and students at the University. It can 'add value' by making learning more dynamic, varied and interactive. But it is not perfect: sometimes it breaks and not everybody knows that it exists or how it works, while others do not want to use some of it.

Key words: teaching, learning, technology, physical learning environments

1. INTRODUCTION

1.1 LDA scheme and project

From October 2012 to July 2013 I did a part-time (0.2) secondment with the Learning Development Centre (LDC) at City University London (City) as a Learning Development Associate (LDA). After discussions with Annemarie Cancienne and Pam Parker at LDC, it was agreed that my LDA project would focus on the use and impact of technology for teaching and learning in physical learning environments (PLEs) at City. This would sit within the Learning Spaces Project that is currently taking place at the University¹. This research area shares space with the research I did for my MSc dissertation² on the impact on learning of virtual learning environments (VLEs) at City, and was therefore of particular interest to me. PLEs are both interconnected and independent of VLEs; they are both fundamental components of City's strategic aim to maximise the student learning experience.

¹ The Learning Spaces Project at City is shared by the Learning Development Centre, Properties and Facilities and Schools and is looking at redesigning the physical teaching and learning spaces at City University to provide students with the best teaching and learning experience possible. Source: <http://www.city.ac.uk/about/education/ldc/sle/learning-spaces>

² My MSc Electronic Publishing dissertation: *The impact of Virtual Learning Environments on learning in Higher Education ~ Case study: an evaluation of the use of Moodle in the School of Informatics, City University London.*

1.2 Project context

Significant recent research suggests that both teaching and learning are affected by technology inside and outside of the classroom. Lomas and Oblinger (2006, p62) emphasise both the importance of technology and the preferences of today's students for learning that is:

"...digital, connected, experiential, immediate, and social. Constantly connected, they seem to have no fear of technology or interacting with people they have not met face-to-face. Although they communicate a great deal online, they still want direct interaction with others. They appear to prefer learning-by-doing rather than learning-by-listening and often choose to study in groups....they become impatient in situations where they don't feel engaged. "

Graetz (2006, p80) agrees that this is both a cause and a consequence of technology's prevalence in everyday life. Higher education learners expect to use the same digital devices they use in their normal daily activities - from shopping to socialising - when learning:

"Today's devices are colliding with yesterday's methods.... the classroom is becoming an interactive, collaborative environment where knowledge is created actively by students, many of whom have devices that are as much a part of them as their own skin and that can be a very important part of this process."

This view, that technology is having an increasingly profound and widespread impact on society as a whole and, therefore also on teaching and learning is shared by Professor John Traxler (Professor of Mobile Learning and Director of Learning Lab at the University of Wolverhampton):

"We need to use these technologies because they transform the nature of teaching and learning, and because the world people are going into – the jobs, the economy that education is supposed to be servicing and supporting – is being changed by these technologies." (Taxler, 2011, p42)

2. AIMS AND METHODS

The aim for this project was to identify and examine the impact on teaching and learning of technologies that are used in physical learning environments at City. 'Physical learning environments' were defined as any space where teaching takes place and, 'technology' was defined as anything used in a classroom for teaching purposes. This included hardware, such as projectors and whiteboards, as well as computer software.

Throughout the secondment I had regular meetings with Annemarie Cancienne and Anise Bullimore from the LDC staff in which I could get feedback on my ideas, receive suggestions, and give updates on progress.

2.1 Methodology overview

I used mini-case studies in order to get a range of ‘snap-shots’ of activity across City University London. This approach involved observations, surveys and interviews. The intention was to gather data that would permit a detailed evaluation of a range of different teaching and learning instances.

I decided on a mixed methods methodology similar to the one I had used in my MSc dissertation. I believed this was an appropriate approach as well as being one I was familiar with.

“A mixed methods research strategy was employed in order to maximise the breadth and depth of data from all stakeholders. This included gathering and analysing quantitative data in order to reveal patterns of use, while also collecting qualitative data so as to be able to drill-down into the detail of the patterns” (Kogan, 2011)

The project had ethical approval as a part of the Strategic Learning Environment (SLE) *Learning Spaces Project*. Each of the data gathering activities involving participants had an information sheet outlining the aims of both this project and the *Learning Spaces Project*.

The data gathering stages are outlined in Figure 1.

	Activity	Purpose
1	Snapshot of student and staff opinion at ‘Don’t walk away; have your say’ event	To identify key themes and themes that might otherwise be missed
2	Analyse list of teachers from time-tabling	To identify a random sample of teachers across City
3	Contact random sample of teachers	To arrange observations and follow-up data gathering stages
4	Observations of sample classes	To get 60-minute snapshots of teaching and learning activity in PLEs
5	Teacher interviews	To discover the motives behind (and opinions of) technology use in teaching
6	Online surveys for students of the classed observed	To collect student data on specific and general technology use for teaching
7	Interactive session at Learning @ City 2013 ³	To gather opinions from session attendees (City and external) on technology use in teaching at City, and to share project data to date with attendees
8	Follow-up interviews with students from observed/surveyed students	To drill-down into the detail provided by the student online surveys

Fig 1. Project data gathering stages

³ “The Learning Development Centre (LDC) held the Learning at City Conference and Exhibition 2013 on June 6th. This was the 5th annual higher education conference to be held at City University London, and the emphasis for the conference was on innovation and creativity in higher education”. City University London, 2013 ‘Learning at City’ (online) Available at <http://www.city.ac.uk/about/education/lcd/events/learning-at-city-conference> Accessed 24 July 2013

This multi-pronged case study approach shares attributes with studies on related, parallel topics such as JISC's (2010) Supporting Learners in a Digital Age (SLiDA) project. That project combined "multiple interactions", including telephone conversations, face-to-face conversations, document sharing, online workshops and site visits.

2.2 A snapshot of student and staff views

The first stage was to get a snapshot of opinions on the use of technology in PLEs from the key stakeholders; students and staff. The intention was that information gathered would feed into subsequent case study evaluation stages and ensure that key components were not missed.

As part of the LDAs, 'Don't walk away, have your say' event, I asked people passing through the University's main corridor to draw lines on a large sheet of paper to link classroom technologies and what they perceived as those technologies' impacts (see Figure 2). Participants were able to add both additional technologies and impacts to the sheets of paper if they wished.

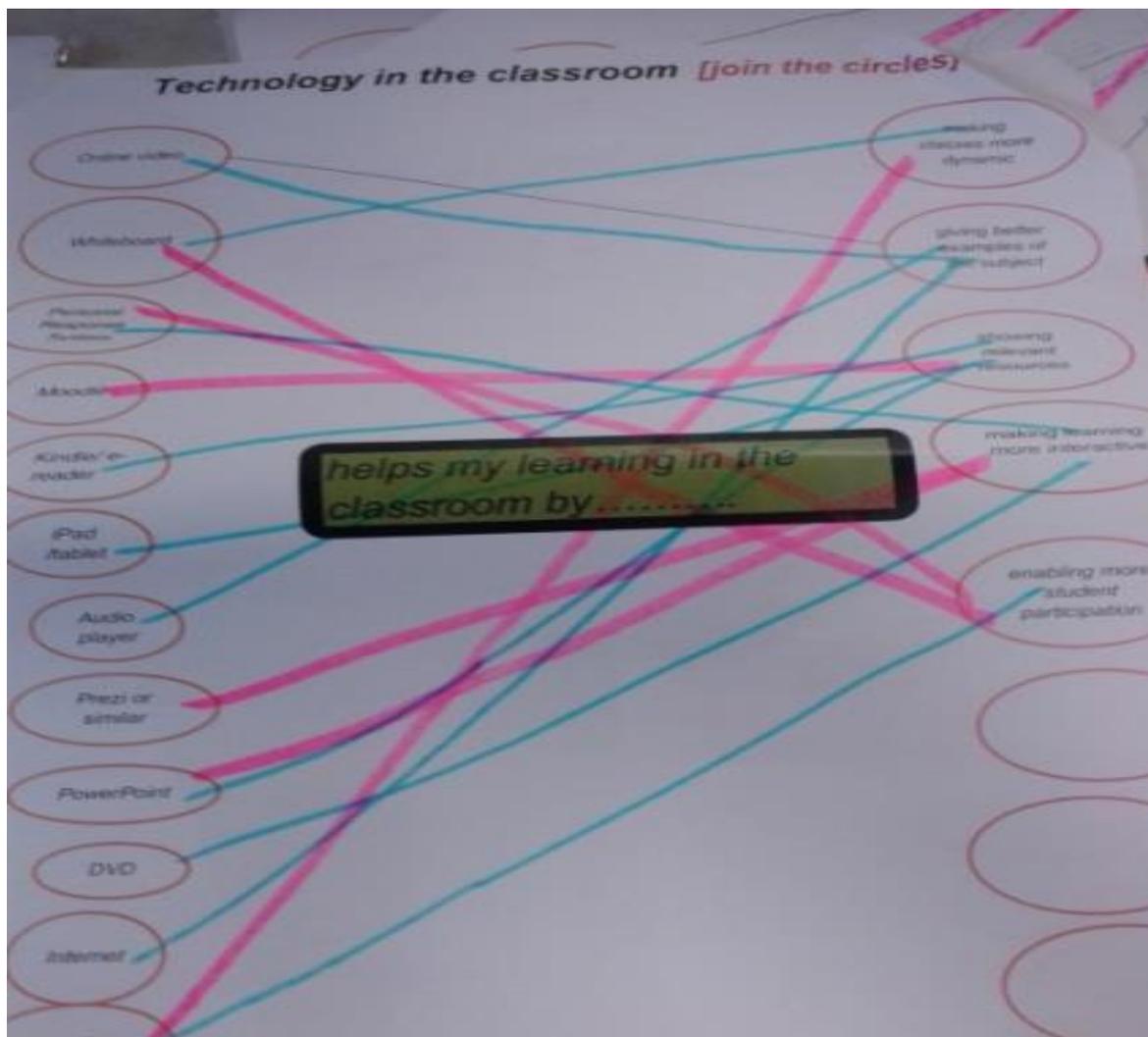


Fig 2. 'Visionnaire' (a visual questionnaire) used for the 'Don't walk away, have your say' event

2.3 Identify a random sample of lecturers across City University

I was keen to involve a broad section of City University London teachers and learners in my research. I asked the time-tabling department to give me a spreadsheet of all teaching that takes place at the University. This would enable me to identify teachers who taught a certain number of modules (I chose three and above) from a range of Schools. I then contacted these teachers and asked if they were willing to take part in my study.

The time-tabling department kindly provided me with almost 14,000 rows of data specifying the teachers' names, their departments, the module names and IDs and the class sizes. I realised later that it would have also been useful to have the classroom details too in order to gauge the spread of teaching rooms used in the sample.

2.4 Contacting a sample of lecturers

My aim was to recruit one teacher from each School at City for my study and use them for all of the PLE data-gathering activities: class observations, follow-up interviews, student surveys and follow-up student interviews.

I used a standard email to contact teachers and to ask if they would be willing to participate. If there was interest, I followed this up with a consent form, further information about the project and I then arranged a date either for a pre-observation chat or an actual observation.

2.5 Class observations

The aim of doing observations was to see what actually happens in PLEs. Although surveying and interviewing people can provide useful data, witnessing activity often gives a different perspective or interpretation of events.

This view is endorsed by DeWalt and DeWalt (2002) who highlight how observations increase both the quality of data collection and its interpretation while also often leading to the development of additional research questions or hypotheses which can benefit the researcher.

In order to have homogenous data from the observation, I used a template (Fig 3) that would track the use of technology and other activity during the 60 minutes I observed the classes.

Device		Time period from class start							
	?	0 – 10	11-20	21-30	31-40	41-50	51-60	61-70	
Pod or laptop?	PowerPoint								
	Prezi etc								
	Internet								
	Film - DVD								
	Film - web								
	OHP								
	Whiteboard								
	Just talking								
	PRS (clickers)								
	Moodle								
	Kindle/e-reader								
	iPad / tablet								
	Audio player								
	Laser pen/clicker								
Incidents			0 – 10	11-20	21-30	31-40	41-50	51-60	61-70

Fig 3. Excerpt of class observation sheet

2.6 Teacher interviews

After each class observation, I asked the respective teachers if they would participate in an interview. I used a standard set of questions (Appendix 1) and recorded the interviews in order to minimise time needed to take notes. Once the interviews were complete, I transcribed the main content from the audio recordings.

2.7 Student surveys

I created an online survey⁴ for students to complete for each of the observed classes (excerpt from this in Fig 4). These were Google surveys which allow anonymous responses from participants. I used a mixture of quantitative and qualitative questions to get both a broad spread of data alongside specific detail.

⁴ Student survey URL - <https://docs.google.com/forms/d/1kN79vf-56NyKFkp-r5ZdoskNoEGdXVzWugRkFDvcA78/edit#>

technology in learning spaces - student survey (a)

Thank you very much for completing this survey. Your answers will remain anonymous. You will be offered the opportunity to discuss your opinions further, but there is no obligation to do so. You may withdraw your participation at any point.

Definitions of terms used in this survey

- (i) 'Technology' is used to describe any equipment or software used in a physical learning environment.
- (ii) 'Physical learning environment' refers to lecture halls, seminar rooms and any type of classroom.

1. Please describe a positive way technology used in a physical learning environment has affected your learning.

2. Please describe a negative way technology used in a physical learning environment has affected your learning.

3. In general, does the use of technology in physical learning environments affect your learning? Please explain how

4. In your experience at City, how often are the following technologies used by lecturers in physical learning environments?

	Every class	Most classes	Half the time	Infrequently	Never	I'm not familiar with this / I don't know
PowerPoint	<input type="radio"/>					
Prezi (or similar)	<input type="radio"/>					
Internet	<input type="radio"/>					
Film (via DVD)	<input type="radio"/>					
Film (via web)	<input type="radio"/>					
OHP	<input type="radio"/>					
Whiteboard	<input type="radio"/>					
PRS (clickers)	<input type="radio"/>					
Moodle	<input type="radio"/>					
Kindle/ e-reader	<input type="radio"/>					
iPad / tablet	<input type="radio"/>					
Audio player	<input type="radio"/>					
Laser pen/clicker	<input type="radio"/>					
Other	<input type="radio"/>					

Fig 4. Excerpt of student survey

2.8 Student interviews

Within the student surveys (2.7) there was an option for participants to volunteer for follow-up interviews. The purpose of these interviews was to drill-down further into answers received in the surveys in order to find the deeper motives and detail behind the answers given.

2.9 Session at Learning at City Conference 2013

I ran a session at the LDC's *Learning at City Conference* in June 2013. The purpose of the session was to both share and collect opinions on technology in physical environments: I would talk about the data I had gathered so far, and I would collect data from the session attendees.

To get opinions from the thirty session participants I used online polling (Poll Everywhere) and other, non-digital ways of gathering data including a poll delivered by paper aeroplane. A write-up of the event including a link to Prezi slides I used can be found in a post I did for the LDC's *Educational Vignettes* blog - <http://blogs.city.ac.uk/educationalvignettes/2013/06/20/technology-in-physical-learning-environments-ldc2013/>

3. FINDINGS

This section examines the data from each of the data collection activities in order to identify noticeable themes. The themes identified are then discussed in the 'Discussion of Themes' section (4).

3.1 A snapshot of student and staff views (*Don't walk away have your say* event)

This was a useful exercise in getting an illustration of students' thoughts on technology in PLEs. I spoke to over 20 students from a range of courses and it was interesting to hear the variety of technology use in PLEs across City as well as opinions of the impact of the technologies' uses. It was also interesting to note that traditional types of classroom technologies such as whiteboards were almost as popular as technologies such as iPads.

New technology, such as personal response system (clickers) received the most positive lines (13), followed by iPads (ten) , Moodle (ten) , PowerPoint (eight) and Prezi (seven). However, traditional equipment such as whiteboards also received significant attention (seven lines).

I wrote a blog post for the LDC's *Educational Vignettes* which describes the event in detail - <http://blogs.city.ac.uk/educationalvignettes/2013/01/16/dont-walk-away-have-your-say-learning-development-associates-event/#comments> – in which I concluded that:

“Both the data collected, and the widespread enthusiasm of the participants suggested that there is broad enthusiasm for the use of technology in physical learning environments. A number of comments were made regarding technology - in its various forms - positively affecting students' learning experiences.” (Kogan, 2013).

3.2 Recruiting teachers for observations and interviews

I had a very good initial response to the email I sent to teachers asking for participants. Within the first 24 hours, three said they would be interested in taking part. Of course, the logistics of arranging observations and interviews are always more complicated than they initially appear, and my aim of getting a teacher participant from each of University's schools was ultimately over-ambitious. I managed to do four in total.

3.2.1 Class observations

It was a real privilege to spend an hour in four quite different teaching settings. It was fascinating to see the types of technology teachers do and do not use. There was a wide range of technology usage from the classes: some teachers used a number of different tools - and these differed amongst the teachers - while one used no technology at all.

There were classes where technology did not behave as it should. This included a pod not producing audio for an online video. This required the intervention of two AV staff with a drill. There were also examples of non-familiarity with technology, such as when a student assisted a teacher to maximise an online video image so that it was visible to the class on the screen behind a pod⁵

It was quite clear from the first observation that it would be very interesting to explore the motives behind technology use and non-use in the classroom. This fed into the choice of questions in the follow-up teacher interviews.

The observations took place in different but similar teaching rooms. All of them had a format of rows of tables and chairs with a central corridor and a pod, a whiteboard and a projector at the front (see Fig 5).

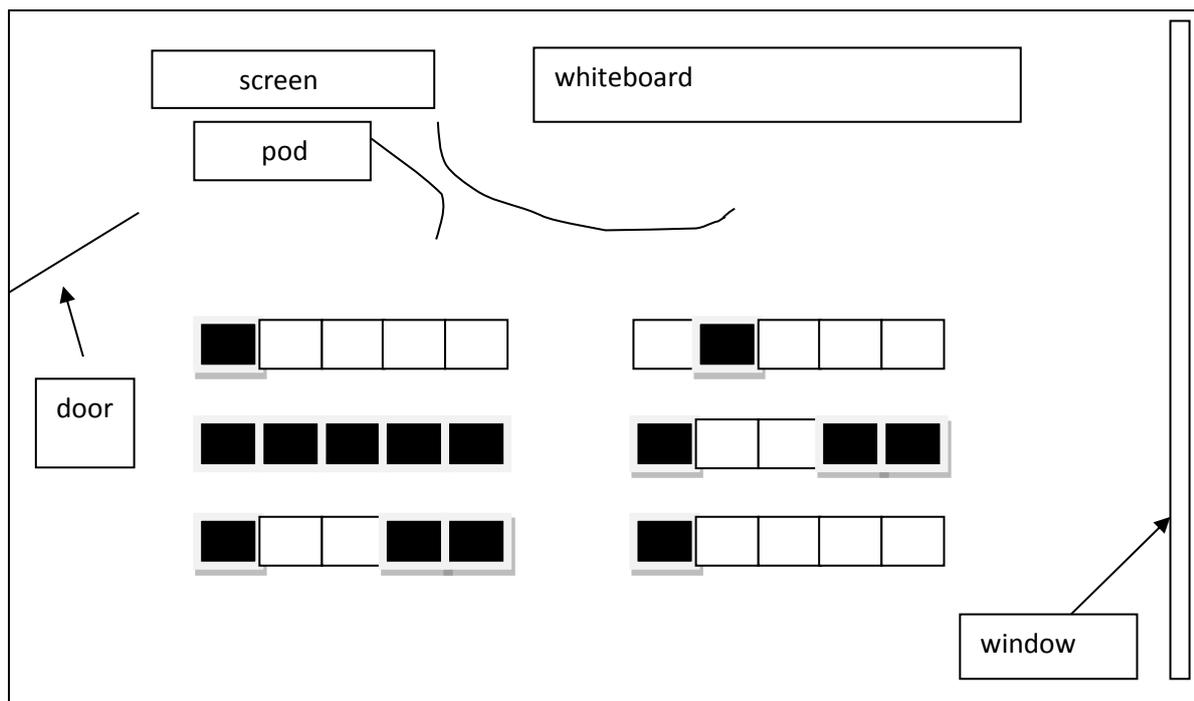


Fig 5. Part of a completed observation sheet with shaded cells representing students and black lines showing teacher movement

⁵ Pods are the technology hubs in City classrooms which house the computer, visualiser and other hardware.

3.2.2 Teacher interviews

The transcribed teacher interviews illustrated that teachers have clear views on the benefits of technology. Their opinions on what technologies to use vary, as do both their motives for using certain technologies and their awareness of what technologies are available.

All teachers interviewed were familiar with the in-class equipment available through the pods, but not all were aware of equipment that is available on request. One teacher said she would like to use personal response systems (PRSs) more often, as she had done previously – to do live polls and gain instant class feedback, while another said she did not know they were available, and had only seen them on television.

All teachers thought that their own use of technology in the classroom brought benefits to the students, and that students would agree that it brought students benefits. One teacher highlighted how discussion is instigated through the use of video in the classroom, another that ‘visualisation’ of the subject was fostered by technology. One teacher highlighted the way that classroom materials – including the use of recordings of class – were appreciated by students who could access them online through Moodle⁶ either as a revision of if they had missed the class.

When asked to describe a positive experience using technology in the classroom examples included using Flip cameras to record mentorship diaries and share experiences, and using video (DVDs) to instigate class discussions by incorporating case studies for emotive subjects that require real examples.

3.3 Student surveys

My intention to survey the students from each observed class shortly after I had completed the class observations was not possible due to the embargo on surveying students while the National Student Survey was being run alongside the your voice surveys and PTES. Hence I could not survey students until May 2013, when many students’ courses had finished and exams had started. This also meant that it would not be possible to organise a ‘hard-copy’ survey in class which would have helped to maximise participation rates.

I asked the teachers from the four classes I had observed to circulate the link to each of their classes online survey. Two teachers actually did this. Of the two that did not, one was unable to circulate as it coincided with another evaluation, and one teacher did not reply.

Realising that the student data sample from the observed classes was going to be small, I decided to use Moodle to ask School of Informatics (Sol) students to complete the survey. I did not want to risk having no data, and as I am based in Sol, I thought students might want to help. There would, I believed, be a low risk of causing ‘not-another-survey-syndrome’ (students could complain directly to me if this were the case). I collected data from one ‘observed’ student and 11 Sol students.

⁶ Moodle is used by City as its virtual learning environment

3.5.1 Technology usage in PLEs

The survey data revealed that PowerPoint was the single most used technology by teachers in PLEs. There was a wide spread of teacher usage in the other technologies with, for example the use of the internet and overhead projectors (OHPs) being used between 'never' and 'most classes'.

3.5.2 Positive impact of technology

There was very clear enthusiasm from students for the use of technology by teachers in PLEs. Participants mentioned how it helps learning by adding dynamism and variety to classes which, in turn leads to discussion, interaction and learning. Some general comments included:

"...technology is useful for explaining concepts in different media, as opposed to the typical lecture slides."

"...it depends on the module but generally a good interaction learning environment can enhance (the) learning."

While specific technologies were singled out for their impacts on learning:

"Use of the electronic voting systems (PRSs) has been useful for reaffirming learning and video /podcasts have been useful for seeing theory in practice."

"Slides viewed in power point form. Clickers - very good way to engage."

3.5.3 Technology not behaving

When asked about negative experiences of technology use in PLEs, there were three scenarios mentioned by students: technology not functioning, distractions caused by peers' technology use and, lack of power sockets.

"Time delays in lectures starting due to technical difficulties and setting up problems"

"Tutor was unable on several occasions to connect her PC to the projector. Poor IT support was to blame"

"Technology not working or problems. Usually in the lecture hall and projectors not working which impacted the start of the lecture as someone would have to come down to fix it."

"When too many people have brought a laptop into a lecture it can often be distracting to see what others are doing, especially when they lose focus and begin playing games in the lecture"

"It is also a hassle to find an available power socket in a lecture theatre"

"... the lack of power points."

3.5.4 Suggestions for technologies currently not available

One technology that was suggested as something that could be used is now available:

“Possibly recording lectures and making them available online, either as an audio recording or as a video on YouTube.”

3.5.5 Relative importance of technology for teaching and learning

When asked to rank four factors in terms of their impact on learning – the teacher, technology, the PLE and the time of the class – ‘the teacher’ was the clear winner. Participants were very clear that technology can help teaching and learning, but it cannot achieve this without a good teacher:

“The technology cannot teach me, the lecturer can. An excellent teacher will almost negate the need for technology. To me technology is a supportive tool - if the best tool is paper, then use paper, if its video etc.”

“I believe that technology is important but it is more a case of how the lecturer uses it than the technology itself. Some of the lecturers use a whiteboard and pen and have no technology present and can produce excellent lectures whilst others could have all the technology in the world and it wouldn't help them.”

3.6 Student interviews

Only one student - the student from the observed class who completed the online survey - volunteered to do a follow-up interview. To date, this has not been done due to lack of time on my part.

4.0 DISCUSSION

4.1 Limitations of the project

Before discussing the meaning behind the data collected during this project, it is important to acknowledge its limitations. The samples were relatively small: 20 ad hoc conversations, four observations, three teacher interviews, 11 student surveys, one interactive session (with 30 participants). It would not be correct to claim that firm conclusions can be drawn from the data with scientific certainty.

However, this does not mean that the data collected holds no value: some clear themes can be identified from the qualitative data in particular. It is also important to remember that the opinion of one person does not increase in importance if it is shared by 99 other people: they are each one person's opinion.

4.2. Teachers use technology and they would like to use it more

The teacher interviews indicated clear enthusiasm for using technology when it adds value to learning:

“Very pro-technology when there is a justifiable need. Needs to fulfil something we can’t do face-to-face, or to provide a fun element.”

But there is a need for technology to have a clear purpose within the session’s broader learning outcomes and aims:

“Tech for tech’s sake can lead to a lot of faffing about or the same results if there weren’t any technology”

4.3 Equipment + awareness + training = power

Not all teachers have the same technology skills, and in some cases lack of confidence, prior training and awareness directly impacts of what technology they use in PLEs. Barriers to learning can exist for teachers as well as for students, and these could be overcome if teachers were more aware of training opportunities that are available to them:

“I like it if it helps, but I’m not a fan of technology as I don’t know how to use technology. I’m not good at using it, but if I knew I could apply it more. As far (long) as it helps me, I use it. But if it’s something completely difficult, it becomes a problem instead of being a tool to help me, it’s an obstacle.”

“I haven’t been brave enough to use pre-recorded sessions...”

4.4 Students value and expect technology in PLEs

Teachers and students mentioned that the use of technology enhances the learning experience by making PLEs more dynamic and classes more varied:

“Discussion has been triggered by videos”

“They see the value that it adds, especially with emotive subjects”

However, not all students are technology-savvy, and some may be reluctant to use equipment themselves. One of the teachers commented:

“(There is) some resistance and worry as (they) don’t use technology. A mixture of student expectation”

Similarly, students learning styles learning and preferences differ, amongst students. This can significantly affect their feelings towards the use of technology:

“It doesn’t impact everyone the same way. It depends on the way they learn. Everyone has a different way of learning”

4.5 Infrastructure

Maintaining technology in PLEs across a university the size of City University London is clearly a big task. In four observations, there was one technical breakdown (within a pod) which required technicians to interrupt the class to fix. The teacher of that class said that it had been the second pod problem that week.

Three of the 11 students surveyed made references to equipment not working in PLEs causing delays to classes: “Time delays in lectures starting due to technical difficulties and setting up problems” implies that there may be significant instances of technical problems affecting PLEs.

5.0 CONCLUSIONS

The data I collected during this project implies that technology in PLEs has an important function which has significant impacts on how people teach and learn. It is not perfect and it is not universally popular, but it is part of the fabric of learning at City University London.

On the whole, teachers and students acknowledge the benefits of technology in the way it brings variety and interaction to learning. Both stakeholders would like technology in PLEs to be more reliable, and both would like there to be more training – or more awareness of training – for teachers so that are able to incorporate it more easily in their teaching if they so wish.

Saying ‘technology is here to stay’ implies that it is unpacking its bags for the weekend. In reality, technology has already left, and is on its way to its next destination. A lot of people at the University realise that there are valuable and attainable benefits in keeping-up with its journey.

6.0 RECOMMENDATIONS

There is an array of useful exciting and useful technology available at the University for teaching and learning. There is a considerable amount of expertise relating to these technologies, amongst both staff and students. However some staff are unaware of what is available or do not have the time to familiarise themselves with what is available.

I think that showcases and staff ‘champions’ that allow staff a glimpse of how useful and easy these technologies, are can help bridge this gap between supply and use.

In terms of further study, it would be interesting to analyse how teachers learnt about the technologies they use and don’t use, and what benefits they think they bring to students. Data collection regarding technology problems such as equipment malfunction would also be useful.

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Appendix 1 - Teacher Interviews

School:		Level:	
Module:		Interviewee:	
Room details (number, type, size etc):		Day & Time:	
Number of Students (register):		How is the module taught?	

In this module: (detail to be removed after interview)

1. Confirm class details re observation
2. How typical was the session I observed of your classes for this module
3. What technology do you use in the classroom when delivering **this** module?
4. Can you describe a good experience you have had using technology'.
5. How does technology support your teaching and the students' learning in this module?
6. How does the learning space for this module impact on your teaching and the students' learning?
7. Are there other technologies which you would like to use but don't?
 - a. What are they?
 - b. What stops you using them? (prompts: availability/lack of training)?

In this and other modules:

8. Describe your attitude to the use of technology in the classroom.
9. What do you think your students' attitudes are to **your** use of technology in teaching?
 - a. How do you think your use of technology affects their learning?
10. What do you think your students' attitudes are to the use of technology in teaching in general?
11. Who decides which technology is used in your teaching?
 - a. Are you encouraged to experiment (by whom)?
 - b. Do you share expertise amongst your colleagues?
12. What do you think makes a good physical learning environment/experience?
13. If you have any comments or questions, please say.