The experiences of University Lecturers when enhancing their teaching through the use of digital technology: a systematic review.

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Abstract:
This review is set within a context of digital technology enhanced teaching with a University. Whilst there is plenty of evidence that computers and the internet have affected many aspects of daily life, there is evidence that the use of digital technology is less embedded within University teaching. This review, therefore, set out to gather and analyse evidence of lecturer’s practice of using technology within teaching. This was accomplished by a systematic search of the education database ERIC resulting in the analysis of sixteen studies. The review showed that lecturers use technology to increase the satisfaction of their students, improve their learning or to mediate changes in their learning behaviour, and they are more likely to achieve this by using technology to teach more. The skills and professionalism of the lecturer are key determinants of student satisfaction when technology is use to enhance their learning.

Introduction:

This review is set within a context of digital technology enhanced teaching within a University. As a study it sets out to explore the experiences of University lecturers as they endeavour to embrace computers, the internet and other forms of technology into the day to day management of their teaching. Tyler (2001) sums up the history of technology within education by discussing some of the very early hype about how computers could potentially transform teaching and learning, he describes hypertext-based learning as having the potential for creating an ‘ideal pedagogic device’. He explains why such an idea may have emerged by quoting Roland Barthes who describes hypertext language as an ‘ideal text’ and Jurgen Habermas who talks of an ‘ideal speech situation’. Add to this the notion that the social networking can contribute to the’ ideal relationship’ (Giddens, 2009) and it could be realistically expected that digital technology in the form of computers, the internet and other forms of hard and software would be essential artifacts within the day to day teaching practice of university lecturers.

There is certainly plenty of evidence that computers and the Internet have affected many other aspects of daily life, from how people engage with information, pay bills, date and find
partners to how they interact and construct relationships with friends and family. Between January to April 2006, 87 per cent of people aged 16 to 30 had used a computer in the previous three months (UK Statistics Authority, 2007) and in America some 93% of teens use the internet regularly and the use of social media (i.e social networking) is central to many young person’s lives (Lenhart, Madden, McGill, & Smith, 2007). It is also clear that the internet offers a number of ways in which communication and relationship formation can occur very easily (McKenna, Green, & Gleason, 2002). Therefore it is possible to conclude that the Internet offers considerable opportunities (Hasebrink, Livingstone, & Haddon, 2008) for education including access to global information, for Social networking and for sharing experiences.

Within Universities, digital technology (which may also be referred to as e-learning) is extensively used; however this is not necessarily within a context of interaction and conversation. It is more commonly used to add notes, timetables, instructions and worksheets into a VLE, such as WebCT, (Fanghanel, 2007). This same study also found that online activities were seen by lecturing staff to have dubious pedagogical value. More recently it has been suggested (Hanson, 2009) that academic identity is changed by ICT and that a lack of firm evidence that the earlier promises of the transformational nature of ICT are being fulfilled is causing academics to resist the use of ICT, and as a result they are strengthening their relationships with students through their face to face interactions.

As part of the ongoing technology agenda Universities have been required to respond to the earlier HEFCE e learning strategy (2005) and prepare local e-learning strategies, the aim of which is to embed e learning activities within the institution and to encourage continual improvement. A recent e-learning benchmarking exercise was undertaken, internally, within a number of participating UK Universities in order for each institution to undertake a analysis of its own e-learning processes, provision and practice, within the context of the strategy. For a number of the participating institutions, however, it was difficult to conclude anything much about the value of e-learning in enhancing learning (HEA, 2009). Respondents to the exercise expressed a concern that the implementation of the strategy was driven more by technological innovation than by institutional need. A further difficulty was that the strategy promoted the segregation of the use of technology to support learning
and teaching from other institutional strategies (Glenaffric, 2008). This has resulted in the updated 2009 HEFCE document ‘Enhancing Teaching and Learning through the use of Technology’. This new strategy aimed to build on the 2005 document by reflecting upon how Higher Education institutions can achieve their individual strategic aims of enhancing teaching, learning and assessment by focusing on the benefits and outcomes from using technology.

There is a considerable body of literature which details the experience of students in their use of ICT as well as the impact of rapidly emerging new technologies such as social networking sites, (Creanor et al 2006, Conole et al 2006) and the part that such resources play on learning behaviour and knowledge construction. It is also evident that 1st year University students expect that ICT will play a substantial role in their education (MORI, 2008). However the same study found that whilst the term ‘digital native’ (Prensky, 2001) may apply generally to students, their use of digital technology is restricted to a number of activities such as social networking, but they are less familiar with resources such as wikis and blogs. However they do expect to access course materials online and to use technology extensively whilst at University.

There is very little literature on the work and experiences of HE lecturers (Lea & Callaghan, 2006) and in particular how context, which includes the ‘virtual’ classroom, the department and the University as well as the lecturer’s relationship with government teaching and learning policy, influences their delivery of teaching. It has been found (Ham & Davey, 2005) that there is a qualitative difference between teaching online and classroom teaching, and a need to ‘humanise and socialise’ the process of teaching in order to ‘feel good about the job’. Such needs have been largely ignored (Ham & Davey, 2005) within the literature which tends to valorize the primary experience of online students (Maton, 2000). Therefore this systematic review of published literature focused on university lecturers who have documented their experience of including digital technology into their teaching.

**Aims of the review**

The aims of the review were as follows:
• to gather evidence of small context specific case studies of the practice of using digital technologies (ICT) by lecturers in their every day teaching in Higher Education Institutions
• to determine the reasons for using digital technologies for teaching and in particular, how the lecturers found out what the benefits to students were.
• to make recommendations for policy and practice based on these findings
• to identify questions needing to be addressed by research so that decisions on policy and practice relating to using digital technology in Universities can be evidence based.

Definitions
For the purpose of the review the term digital technology will refer to computers and the internet plus a variety of hardware and web based software that are designed to support person to person or person to information interaction, as listed below:

Blogs - also known as Web logs, these allow students to post thoughts and updates about their studies on the Web.

Wikis - sites like Wikipedia and others enable students from any location, to add and update online content.

Social networking - sites like Facebook and MySpace allow students to build and customize their own profiles and communicate with other students.

Web applications - a broad range of applications that make it possible for students to use web browsers such as Firefox, email programmes and word processors, plus games and other utilities

Virtual Learning environment (VLE) - A VLE is a virtual classroom that allows teachers and students to communicate with each other online. Class information, learning materials, and assignments are provided via the Web.
Personal response systems (PRS) – part of a group of electronic, interactive teaching tools. This includes Student Response Systems (SRT) which are designed to allow students to respond collectively, for example, to MCQ’s or to vote within a classroom context; other examples of PRS’s are classroom based technology including interactive whiteboards and visualisers.

Personal Digital Assistants (PDAs) - small hand held electronic devices that allow students to organize their schedule, take notes, do maths calculations, play games, write memos, surf the Internet and send e-mail.

Podcast - The name "podcast" combines the terms iPod and broadcast into a single word. Podcasts are audio and video broadcasts (such as lectures) that can be re-played on a computer or a portable music player such as an iPod.

The review questions

The evidence collected as part of the process of this review aimed to answer the following overarching question:

- What are the experiences of University lecturers regarding their use of digital technology in their teaching?

This answer to the above question was determined by the answers to the following subsidiary questions:

- Why did the lecturers think that introducing digital technology would be useful?
- What did they aim for by introducing digital technology?
- How did the introduction of Digital Technology benefit their students?
Methods used to identify relevant studies

The following criteria guided decisions about which studies were included:

Language of the report: all studies included in the study were written in English. Whilst there is no doubt that there are many other very useful studies there were no facilities available for translation as part of this research study.

Focus on digital technology use: Case studies that were set in the context of University lecturer’s own perspectives were included in the review and were required to provide direct evidence of teaching and learning activities that were designed to include the use of digital technology explicitly.

Case study design: studies were only included if they evaluated the effects of the initiative to introduce technology into their teaching, in particular studies that employed methods to study the benefits of the initiative to the students. This included outcome evaluations including pre-/post-test results, interviews, focus groups and surveys.

Process evaluations were that included a range of evaluation methods (including narrative analysis, observations surveys, in depth interviews) were also included.

Setting and population: Studies were only included if they reported on case studies set within a context of Higher Education (anywhere in the world); this included studies of undergraduate and post graduate students from the age of 18. Studies dealing with students outside of this setting, in primary or secondary school settings or colleges of Further Education, were excluded.

Date of the studies: Only studies published during 2007, 2008 and 2009 were included in the review. This was to ensure that the findings would be relevant to the contemporary work of Lecturers within Higher Education.
**Search strategy**

The search for studies meeting the inclusion criteria began by searching bibliographic databases and registers of published educational research. Relevant articles that are included in the education database ERIC were searched and articles that met the inclusion criteria were found as full text articles using the database Swetswise. The following key words were used:


Study titles and abstracts were reviewed before the article was included in the initial list. The list of articles that resulted from the initial searches were then screened using the inclusion and exclusion criteria before being included in the final list.

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
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<tr>
<td>Studies that include:</td>
<td>Studies that are not:</td>
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<tr>
<td>• Any kind of digital technology that lecturers included for teaching purposes</td>
<td>• A specific description of events set within a clearly detailed context</td>
</tr>
<tr>
<td>• Methods of evaluation to study the benefit to students</td>
<td>• Focused on digital technology</td>
</tr>
<tr>
<td>• Outcome evaluations including pre/post test results, interviews, focus groups and surveys.</td>
<td>• University based</td>
</tr>
<tr>
<td>• Process evaluations including narrative analysis, observations surveys, in depth interviews.</td>
<td>Also:</td>
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<td></td>
<td>• Do not document the benefits to students</td>
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<tr>
<td></td>
<td>• Older than 2007</td>
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<td>• Not written in the English language</td>
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A total of 16 articles were finally accepted for the purposes of the review. The synthesis grid can be found in appendix 1.
Results

What are the experiences of University lecturers regarding their use of digital technology in their teaching?

**Section 1:** Why did the lecturers think that introducing digital technology would be useful?

The themes that emerged from the analysis of the included studies suggested that there are defined reasons as to why a lecturer will introduce digital technology into their teaching. The first theme is that of a desire to remove or change the boundaries of power and control. This was highlighted in three studies which set out to transfer some of the power and control inherent within teaching and learning, held traditionally by lecturers, to their students. This included control of the learning space itself, the selection of content and material for learning, or the pace at which the students could engage with the materials.

The studies identified within the context of this theme aimed to empower students by focusing the use of technology on the way that it could support their learning needs as well as delivering discipline specific content. The central feature of these studies was to break down conventional boundaries between students and academics in relation to communication and teaching practices as a way of determining the structuring of the learning space, which was quite specifically designed to improve the skills of the student.

For example, Lenne, Abel, Trigano, and Leblanc (2008) used an online learning environment that adapted to the emotive, cognitive and behavioural needs of the learners as a way of promoting self regulated learning. They set out to transfer power to the student in order to learn by increasing their involvement and responsibility during the learning process. Ng’ambi and Brown (2009) removed boundaries related to time and space by designing an online environment in which students could anonymously post questions about course content and receive responses from both the lecturer and other students at any time. Allowing all students to contribute, including those who may find it difficult to ask questions
and speak out in face to face situations was a particularly important consideration within the design of the environment.

In each of these studies there was a blurring of the boundaries between the everyday experience of the students and their university experiences. For Moore (2004) this relates to a desire to remove differentiation by transforming educational processes through a reflexive process of challenging the assumptions, related to the University, that underpin the power relationships inherent within the teacher student relationship. However, whilst there is an apparent shift of power in terms of teaching practice and communication in these studies, expertise in terms of knowledge remained under the control of the lecturer.

Lenne et al (2008) state that ‘the course was designed based on the experience and evaluation methods provided by traditional teaching,’ and that self regulation and motivation determined the level to which students could exploit the resources made available to them. For Ng’ambi the initiative arose over a difficulty in providing support and attention to a large class of over 600 students. Questions about exam preparation were very popular by comparison with questions relating to career options and how to study. In another study (Demetriadis, Papadopoulos, Stamelos, & Fischer, 2008 ) which focused on case base learning in what the authors called an ‘ill structured domain’, scaffolding prompts in the form of questions generated by the lecturers were used to guide the learning process. They were used to direct the students and to engage them in deeper processing of information presented in their case-based course materials.

In each of these studies the lecturer was the expert and had knowledge and advice that the student must learn. Pedagogy, in this sense, was highly visible. The boundaries of power between the lecturer and the student have become weakened whereas control of interaction in terms of the structure of the learning experience and how it is to be evaluated remained firmly with the lecturer (Bernstein 1996).

In another group of the studies both power and control remained with the lecturer. A desire to improve student learning resulted in the lecturer enhancing their teaching by giving more teaching. This meant making teaching more intensive, more efficient, providing more
resources or to increase the lecturer input through the addition of technology to their traditional teaching.

This included, for example, enhancing in-class lectures with weblogs (Shim & Guo, 2009) or adding a ‘blended’ component to traditional teaching in the form of a website (Delialioglu & Yildirim, 2008) which included a number of cognitive tools. In another study a Virtual Learning Environment (Shah and Cunningham, 2009) was introduced into an orthodontic training programme and to a Nurse Education programme (Mitchell et al 2007) in addition to other traditional teaching methods. Improving the efficiency of traditional teaching through the use of technology was the intention of a number of studies. They included, for example, improving the efficiency of the traditional lecture through the use of video formatted lectures (Dey, Burn, & Gerdes, 2009) and offering a mix of power point and podcasts instead of lectures (Griffin and Thompson 2009).

The work of Ferenchick et al (2008) was to design a web based authoring tool for hand held computers (PDAs). This resulted in additional learning resources in the form of software, in order to support specific competencies for medical students (centered around specific problem areas eg. Diabetes, substance abuse etc). The software was also intended to help the student to convert their learning from the PDA into safe patient care; in turn the software then tracked, documented and stored the student - patient interactions. The students used the device when on clinical placements in geographically remote places. Nagy-Shadman and Desrochers (2008) aimed to enhance student learning by increasing understanding, participation, alertness, and interactions with fellow students, through the use of Student Response Systems in the context of multiple choice questions in science classes.

In all of these studies there is a clear distinction between the role of the lecturer and the role of the student, and there is very little in the way of weakening of the boundaries between the everyday knowledge of the student and disciplinary knowledge of their University course. In each case the content to be delivered by technology and how it is to be evaluated is very clear to students and lecturers, a visible pedagogy (Bernstein 1996). The
only boundary change is between home and university, with a view to facilitating study outside of a confined timetable.

Two other studies were designed to help students to integrate the knowledge gained at a lower level and move their understanding vertically and across a wider range of different phenomena (Bernstein 1996). Kraemer (2008) designed a course that emphasized student centered, engaging and active learning, and assisted the student to work towards enhanced proficiency of German language (language and reading) within a context of fairy tales that also increased the students knowledge of broad sociological themes. Another study used technology as a way of enabling reflection, engaging with the creative processes and as a creative tool in dance education (Doughty, Francksen, Huxley, & Leach, 2008 ). An integrated approach aims to personalize the learning environment so that competence is explored in an individual and often therapeutic way. Self reflection and realization is emphasized as is socially based peer learning.
**Section 2:** What did lecturers aim for by introducing digital technology?

This section of the review will explore just what the studies described above aimed to achieve through the introduction of digital technology into teaching. By exploring how the lecturers involved in the studies determined the success of their actions it is possible to document their intentions in relation to benefitting students and their learning. Details of the findings of the evaluations will be analysed and discussed in section 3.

The majority of the studies documented an aim to satisfy students, and to improve learning or to change student learning behavior, monitored through the use of automatically logged data. The majority of studies also used a combination of methods to assess how successful their initiative had been, as a way of capturing the complexity of those aims. Satisfaction was surveyed either in relation to the students’ overall experience of learning through the use of technology, or of their perceptions of the effectiveness of the teaching tool. This involved survey tools (mainly likert style surveys) or interviews (two studies) in order to establish student views. Four studies aimed to improve learning and used pre and/or post testing to measure the improvement. Three studies explicitly aimed to change the behavior of students and analyzed the data collected automatically by the teaching tool in order to observe for changes. One author undertook a detailed qualitative analysis of student posting to document intended and unintended student use of the learning environment, and one author also explored the student’s epistemological beliefs, as well as a pre and post test of student learning, as a way of understanding student activity. In summary therefore the aim of lecturers when using technology to enhance their teaching is to improve student satisfaction, improve student learning and to mediate a change in student learning behavior.

The table below summarises the types of evaluation methods used and the number of studies employing the method:
### Evaluation method

<table>
<thead>
<tr>
<th>Evaluation method</th>
<th>Number of studies using this method</th>
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<tbody>
<tr>
<td>Student perception survey</td>
<td>10</td>
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<tr>
<td>Pre / Post testing</td>
<td>4</td>
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<tr>
<td>Epistemological Belief instrument</td>
<td>1</td>
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<tr>
<td>Qualitative narrative analysis of student postings</td>
<td>1</td>
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<tr>
<td>Interviews with students about technology experience</td>
<td>2</td>
</tr>
<tr>
<td>Observations by the author</td>
<td>2</td>
</tr>
<tr>
<td>Automatically logged data of student activity</td>
<td>3</td>
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**Section 3: What were the benefits to students?**

**Student satisfaction**

All of the studies but one that surveyed student perceptions about the use of technology in teaching, reported positive findings. Three studies reported a significant level of support for future use of technology in their learning, including, 98% of the students in one study suggested that using a website to support learning should become a permanent resource for the course (Mitchell, Ryan, Carson, & McCain, 2007), and another suggested that the use of a virtual learning environment should be a mandatory component of their learning (Shah & Cunningham, 2009), and in another study two thirds of the students reported that technology increased their enjoyment of learning (Farah & Maybury, 2009). This seemed to relate to the students’ expectations about the use of technology rather than their positive acceptance as their perceptions about their immediate experiences were much more mixed. The one study (Delialioglu & Yildirim, 2008) that did not support the others in terms of increased satisfaction because of the use of technology found that in their controlled experiment (blended vs traditional teaching methods) there was no difference between the groups in that they both reported high levels of satisfaction.
Most studies reported that students saw certain components of learning using technology more positively than others. This included things such as having access to helpful and up to date information, being able to access tools that allow for cognitive development, flexibility of access and the ability to use resources that included multiple representations of concepts and topics including texts, images and sounds. The theme that emerges in these studies, however, that has most effect on student views is the involvement of the lecturer, particularly in relation to feedback. Judgment on their performance or prompts to direct them to explore new knowledge domains, along with the use of immediate feedback in the classroom using tools such as student response systems, were the techniques that were received most positively by students.

There are caveats to these general findings that support the idea that the factors that affect learning are complex. Two studies (Shim & Guo, 2009) and (Shah & Cunningham, 2009) suggest that socialization into the use of digital technology is significant, and the more experience that students have of using technology in their learning, the more positive about it they become. Some studies recognized that not all their aims could be met; for example (Lenne, Abel, Trigano, & LeBlanc, 2008) and (Shah & Cunningham, 2009) social learning and the use of bulletin boards and forums were not recognized by the learners as important to their learning. Two studies (Demetriadis, Papadopoulos, Stamelos, & Fischer, 2008) and (Kraemer, 2008) reported that, whilst the students acknowledged the benefits gained from the additional learning activities they found the experience to be tiring and reported negative feelings about the work load involved.

**Improved learning**

A number of studies reported improved measures of learning in their students as a result of introducing digital technology. Two studies (Griiffin, Mitchell, & Thompson, 2009) and (Dey, Burn, & Gerdes, 2009) reported their use of alternative methods of delivering lectures and the latter study found that when students watched a video of a lecture their comprehension and recall of the lecture was significantly higher than those students who had attended the same lecture but the live version. The former study found that synchronizing a podcast with power point slides so that movement from one slide to another was out of the control of
the student worked better in terms of student scores for learning then when the student could control the movement of the slides in relation to the podcast.

In both of these studies the presence of the lecturer was a significant feature. In the first study, the authors videoed a live lecture and then played this to students with a picture of the lecturer embedded in the presentation and then for some students presented the same lecture but without the embedded image, just the lecture slides and sound. The presence of the lecturer enhanced enjoyment but made no difference to recall or comprehension. It was also found that when comparing the live lecture with the videoed version of the same lecture, the students rated the live lecture as higher quality and believed that the lecturer made more sense, but scored significantly lower in terms of recall and comprehension than either of the other two videoed formats. In the podcasting and power point study the overall preference by the students was for a traditional lecture with a live lecturer.

In a study (Demetriadis, Papadopoulos, Stamelos, & Fischer, 2008) that documented a course that had previously allowed the students a lot of control over their learning in what the authors called an ‘ill structured’ online environment, it was found that adding scaffolding in the form of elaborate questions activated by the lecturer resulted in significantly higher scores in the post learning experience test.

Two studies failed to find a significant difference in the learning of their students. In one study (Delialioglu & Yildirim, 2008) the authors compared blended learning as a method of course delivery, in that they designed a very detailed website which included additional resources which the students accessed independently, with traditional live lectures only as the main method of course delivery. In this case the students did not show any difference in their levels of achievement. The other study (Farah & Maybury, 2009) compared learners who accessed a virtual microscope and added resources in a virtual learning environment, with students who used a traditional light microscope in the university laboratory, and found no difference in post-test knowledge quizzes. Students reported that it had changed ‘how’ they learned but not necessarily ‘what’ they learned.

Learning behaviour changes
Three studies evaluated their initiatives through qualitative methods. In one study (NgAmbi & Brown, 2009) the authors analysed the postings made by the students in a website designed to encourage anonymous questions to the course lecturers any time, by text or email. They found that the site had supported the intended aims of the project in that students engaged with their learning actively and articulately but that there were also unintentional findings as well. The site became a place for ongoing, formative evaluation of the course. Lecturers received immediate feedback about their teaching and administrative skills and students took control of all aspects of feedback both in terms of their questions and in their feedback to the course team. However that feedback did result in some abusive messages about lecturers and other students from a minority of students.

Focus groups were used in two other studies. In one (Shah & Cunningham, 2009) the students were asked for their views generally, about the addition of VLE’s into their learning. The authors report that students acknowledge that they would need to be more responsible for their learning, but it is the collaboration of lecturers and students that will determine the power of the VLE as a learning resource. They also felt that the VLE could not be substituted completely for the teaching process. Problems of inequality for some students, relating to the cost of printing of learning materials from a VLE and the difficulty of coping with limited IT skills, were reported in one study (Mitchell, Ryan, Carson, & McCain, 2007) as reasons for not engaging with a website explicitly designed to reduce inequality through the use of digital technology.

Analysing the data that is automatically logged by the computer was another way of assessing the impact of technology on the learning behavior of students in the studies. These results show that different students access the website more or less frequently than others, but complex patterns of use of resources in terms of individual problem solving are evident for some students. However in a study (Ferenchick, Fetters, & Carse, 2008) designed to support medical students out on clinical placement it was found that the students were more influenced by the formative assessment of their knowledge than the skills needed to solve clinical problems that they faced with patients.
Discussion of results and implications

The review has provided evidence that there are definable reasons as to why lecturers use technology to enhance their learning. These are, to increase the satisfaction of their students, improve learning or to mediate a change in their learning behaviour. The most likely way that lecturers will attempt to achieve this is to use technology to teach more. The logic of such an action appears to be obvious: more teaching leads to more engagement by the student, leading to more learning. There are positive outcomes documented in the review which suggest that such a strategy is useful. Lecturers teach more by increasing the resources available to students in websites, VLEs, PDAs, SRTs, white boards and videos and podcasts, and access is unrestricted by time or place. Such activity would appear to offer a suitable solution to the difficulties lecturers and students face within a system of mass higher education.

The review has highlighted however that lecturers found that some resources and activities are more positively experienced by students than others, and that it is the skill and professionalism of the lecturer that is the real key to the success of the initiative. Despite a well documented description of the contemporary university student as a ‘digital native’ who expects to use technology as an integral part of their studies, the review has also provided evidence that students also have a very clear and traditional view of the role of the lecturer. Student – teacher interaction based on ‘comment – response – feedback’ remains a dominant feature of the communication processes documented in the case studies explored in this review. This is despite the extensive use of the internet in more general contexts, for communication and relationship formation. The expectation of students relating to their interaction with lecturers remains an important determinant of student satisfaction, and evidence in some of the studies included here suggests that the relationship between satisfaction and learning, in the context of technology use, is not clear, and requires further exploration and research in relation to practice and policy.
Whilst the majority of students included in this review did appear to benefit from the use of technology in teaching, there is also evidence that this is not the case for all learners. Epistemological beliefs, financial constraints, time constraints and cognitive constraints were all documented as barriers for students when accessing learning from technology. For these students, giving them more teaching through the use of technology may simply enhance the barriers that affect their learning and satisfaction, which will result in increased stratification rather than less. Equality of opportunity within a context of technology is a field that requires attention at practice, policy and research level.

The link between socialisation into the use of technology and student satisfaction is a theme emerging from the review, and suggests that comprehensive, cohesive, institutional wide teaching and learning strategies that incorporate technology are necessary. The most powerful socialising forces in Universities relate to the artifacts of success – assignments, the result of a performance-orientated mode of pedagogy (Bernstein 1996). This results in a relationship between lecturers and students that is based upon a deficit model and it is generally what is seen as lacking in students that becomes important. Some students become better placed to recognise the rules that determine their individual success, whilst for others they will be left behind until they too can recognise the rules (Bernstein 1996). Increasing the amount of teaching and making it more intensive may not help them. How the socio-cultural influences and the resulting rules are recontextualised into pedagogy through the use of technology is unclear from the case studies analysed in this review, and requires further exploration and research.

**Limitations of the study**

Small context-specific case studies of lecturer use of technology to enhance teaching are important resources for practice development in Universities. They provide real experiences relating to the successes and failures of projects and initiatives and when shared can communicate good practice and prevent reinvention of practices that have little value, either from learning or an economic perspective. Finding a way to successfully synthesise the findings of the many reported case studies could result in a useful contribution to the
literature relating to technology use. Synthesizing the findings of the case studies for the purpose of this review has resulted in some interesting and useful findings that could support the work of individual lectures and support policy development. However the process has also resulted in difficulties that prevent the use of empirical rigor normally associated with systematic reviews, including the meta-analysis of statistical data and the synthesis of multiple evaluation methods other than through a narrative approach. This is partly because there is a lack of agreed language relating to the success criteria from which lecturers can articulate their experiences of using technology in their teaching. More research into evaluation tools that are relevant for technology enhanced learning and for suitable methodologies for synthesizing case studies need to be explored and tested.

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