The impact of digital technologies on teaching and learning

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Abstract

This thesis explores the impact of new technologies on learning and teaching and draws on research work carried out over a ten-year period. The thesis looks at the facilitators and barriers to using digital technologies effectively and explores the challenges for educators as they respond to the changes brought about by these digital technologies. It presents eight published works that have investigated the impact of digital technologies and collected data using a range of qualitative and quantitative techniques.

The core paper provides a model by which the impact of digital technologies can be analysed and understood and the remaining papers populate that model. The model identifies a system of learning spaces that describe the ways that learners, teachers and managers respond to the challenges and opportunities that digital technologies bring to learning. The papers explore how the school space, the teaching space, the personal learning space and the living space have all been transformed by digital technologies.

These papers highlight the ongoing tension within education brought about by the conflicting ambitions of managers to control learning while at the same time encouraging personalisation. The papers consider the nature of digital divides and also the potential hazards presented to young people by digital technologies. Finally, the papers explore the relationship between the use of digital technologies and academic achievement.

The work presented here provides a coherent contribution to the field that offers new understandings of the impact of digital technologies on learning, and identifies key issues for further research.

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Overview and theoretical synopsis

The development of any new technology provokes excitement and concern, often in equal measure. The opportunity for change and development is matched by a resistance to the loss of the old ways. Nowhere is this more evident than in the conservative world of education. Digital technologies are self evidently changing the ways that we communicate, access information and process that information to better understand the world and behave in it (Craig & Wilsdon, 2004). Learning appears to be transformed, but is it? Are we changing the way we deal with knowledge and gaining new understandings or are we just using new toys to do the same old tricks? Digital technologies allow us to revolutionise how we teach and how we learn but the early high expectations for academic improvement have not been fulfilled (Hokanson & Hooper, 2000; Tamin, et al., 2011) and concern remains about the negative impact on learners and learning (Banyard et al., 2011; Banyard & Underwood, 2012).

This thesis explores the impact of new technologies on learning and teaching and draws on research work carried out over a ten-year period. The thesis looks at the facilitators and barriers to using digital technologies effectively and explores the challenges for educators as they respond to the changes brought about by these digital technologies.

1. Learning

What do we mean by learning?

The exploration of how we learn and what we mean by learning has been a central concern for psychological research from the philosophies of Hobbes, Locke and Mill up to the present day. The general understanding of learning is of a change of state in an organism that is remembered and can lead to change in behaviour, and this change of state is brought about by experience. One view of learning sees leaners as passive recipients of experience and the behaviourist approach was an example of this. Similarly, cognitive approaches initially focused on a machine metaphor and looked at specific changes in memory, attention and information processing (Crook, 2007).

In contrast to this view, the constructivist approach of Piaget (1953) looks at how people learn by making sense of their experiences. One reading of the constructivist approach can see it as an argument for allowing learners to discover essential information and skills for themselves and to manage their own learning.

These contrasting views of learning and learners frame modern debates about education, especially around education policy. For example, the constructivist view is challenged by studies that suggest that within the context of formal learning guidance or direction is required by most learners (Kirschner, Sweller & Clark, 2006). The current dominant view focuses on learners' active participation in acquiring knowledge and developing skills, much of which takes place without instruction. In parallel to this it argues that the highly organised knowledge systems, such as sciences, mathematics and literature, require formal training, commonly in schools (Bransford, Brown & Cocking, 1999).

The historical focus on experience has led philosophers to argue that learning comes from personal experience that is reflected on and then acted on. For example Rousseau writes "Give your scholar no verbal lessons: he should be taught by experience alone" (Rousseau, 1762:77). This approach to learning as a personal journey along with the view of teaching as being a process of guiding rather than instructing has been a recurrent theme over the years. When Papert (1993) commented on the introduction of computers to learning he wrote "I am convinced that the best learning takes place when the learner takes charge." (1993:25). Although these ambitions still have currency today they are enacted within a state education system that has different aims for the mass education of the people.

The state education system in the UK provides a structured National Curriculum that has clear developmental stages and assessment targets. In their statements of aims the UK government refers to values for learning that relate to "ourselves, as individuals capable of spiritual, moral, social, intellectual and physical growth and development" (DfE, 2011) but the involvement of central institutions of government in provision of education extends into the design, content and delivery of individual subject syllabuses (see the example of A-Levels below).

This mixed ambition of aiming for individual personal growth by using set and restrictive curricula provides a difficult and maybe impossible challenge for educators. When A.S. Neill put the learner at the centre of their learning at Summerhill School he had the one aim to make the school fit the child instead of making the child fit the school (Vaughan, et al., 2006). A national curriculum does not allow this approach because it creates standard tasks for all learners and focuses on the average performance of learners in a school as the measure of quality.

The example of A-Levels

One of the practical implications that arise from the debates around learning can be seen in the design of syllabuses. For example, the key qualification for school matriculation and one that acts as

the entry qualification for university is the General Certificate of Education Advanced Level (A-Level). These examinations are commonly held to be the 'gold standard' of qualifications by politicians and education commentators (see for example, Judd & Ward, 1997, Paton, 2014). Their position within the school curriculum makes them subject to political attention and frequent reviews, most recently by Secretary of State Michael Gove with reformed courses commencing in 2015.

This recent reform has been informed by two key reports, the first is based on a survey of higher education, teachers and employers on the suitability of A-levels (Higton et al, 2012). This report suggests that there is general endorsement of A-levels by stakeholders but it also identifies gaps in skills and a mismatch between the subject content in A-level and that required by higher education institutions. The second report is an international comparison of equivalent qualifications to A-level (Ofqual, 2012). This report raises questions about demand and challenge of the current A-levels, the breadth and depth of particular courses and of the A-level programme as a whole, and design of assessments (see Appendix 4 for an illustration of the strengths and weaknesses of standardised assessments in the development of A-Level Psychology). These reports highlight the focus of the reform on academic achievement rather than the personal learning of the learner.

The impact of these reforms has been to remove coursework from most subjects including science, to remove modularity from courses and to base assessment on end of course examinations. These changes rebalance A-Levels away from student-centred learning and more towards a model of the passive learner. This conflicts with other national initiatives such as that for personalising learning.

Personalising learning

The conflicting aims for learning presented above are that it should (a) provide a journey of individual discovery that is self-determined and (b) respond to the perceived need to train people to be successful in the modern world economy. This conflict creates a tension within the theory and practice of education. An example of this can be seen in the drive toward personalised learning.

When the government started a national conversation on personalisation it defined it as "…the drive to tailor education to individual need, interest and aptitude so as to fulfil every young person's potential" (DfES, 2004). The Gilbert Review of Teaching and Learning in 2020 (Gilbert et al., 2006) took this further arguing that there is a need to ensure that personalised learning is a reality in every classroom, and the report sets out a vision for how teaching and learning should develop in the decade up to 2020.

The drive to personalisation was accompanied by political and academic support (Miliband, 2004; Leadbeater, 2004, 2005) and contained an optimistic rhetoric about the benefits of personalisation for narrowing achievement gaps and driving up standards. The issue here is that the phrase 'driving up standards' refers to improvements in test scores. The conflict in the vision here concerns the role of the school as either a high performance learning organisation or a person-centred learning community (Fielding, 2006). The required judgements for a school to be defined as good or outstanding include "the achievement of pupils at the school" (Ofsted, 2012) but not the personal growth of individual leaners or the development of a community focused institution.

The view of personalisation put forward by the government defines the goal state that the learner should aim for. In other words, as a learner you must go from one set point (A) to another set point (B) but it doesn't matter how you get there. That journey between A and B is what you are able to personalise, but not the goal of your learning. Fielding (2006) argues that this personalised learning agenda is disguising what is essentially another form of control. He argues that the focus on performance is demeaning and unlikely to produce the kinds of results intended.

There are many research questions that derive from the personalisation initiative. Some of these are pragmatic questions around teaching and learning such as what techniques promote personalised learning, what are the impacts of these techniques and what is the response of students who experience these personalised programmes of learning? Further questions can explore the factors within a learning environment that interacts with the personalisation agenda such as the e-maturity of the school (Underwood & Dillon, 2004). Furthermore, there is a question to ask about the conflicting demands of personalising learning and achieving success in examinations. Is it strategic to adopt a personalised learning strategy if a more focused and drilled technique will obtain higher results?

If personalisation is the route to better and more effective learning then it is important to consider what can be the drivers for this change. One answer may be to look to digital technologies.

Learning and technology

New technologies bring opportunities for change and the digital technologies have been seen as having great potential benefit for learning. For example the Secretary of State for Education said, "I see ICT and its potential to transform how we teach, learn and communicate as crucial to our drive to raise standards." (Ruth Kelly, 2005).

The deployment of digital technologies in learning creates new potentialities but it also poses a challenge to the centralised model of learning promoted by governments. The communication theorist Harold Innis writes

> new technologies alter the structure of our interests: the things we think about. They alter the character of our symbols and the things we think with. And they alter the nature of community: the arena in which thoughts develop. (1954:20).

Innis' comment is derived from his work on ancient civilisations and at the time that he was writing, in the middle of the twentieth century, he argued that contemporary advances in communication had the effect of enlarging the range of reception while at the same time reducing the points of distribution (Carey, 1989); in other words – broadcasting. Innis argued that an oral tradition of knowledge transfer within a society (in contrast to a written tradition) challenges the development of monopolies and enhances the democratic processes within that society. In contrast, the digital technologies of the twenty first century create an opportunity for learners to take more control of their learning and to engage in sharing of personal understandings that is a new manifestation of the oral tradition.

Social media provide an opportunity for greater democratisation of our everyday lives. Although the role of Facebook and twitter in the Arab Spring of 2010 have been overstated, it is clear that social media have an impact on political events (Beaumont, 2011; Brym, et al., 2014). These social media take broadcasting out of the hands of powerful organisations and allow individuals to take part and follow their own agenda. In the area of education these facilities democratise learning by giving greater access to knowledge and ideas and greater opportunities to form communities of expertise and to disseminate information. They also take learning beyond the classroom into the living space of learners (Underwood, et al., 2009a).

Digital technologies provide a vehicle that can drive forward the personalisation agenda. In fact they can drive forward both of the contrasting approaches to personalisation. They can create structured learning programmes and central control of learning through resources such as a Virtual Learning Environment (VLE) and support the ambitions of the high performance learning institution. On the other hand they can also support the student-centred approach by offering learners greater opportunity to plan their own learning and explore the almost unlimited sources available. The question then concerns the impact of these two approaches. What does the learner experience of this personalisation and, for example, does the VLE promote student-centred learning or does it just manage the learners (Banyard, et al., 2011)?

As the rhetoric of learning has become more about personalisation and learner-centred teaching, digital technologies have arrived to facilitate this personalised agenda. Sharples (2000) points out that digital technologies are personal, user centred, networked, ubiquitous and durable, and that these are the key qualities (by different names) of lifelong, personalised learning.

There are clear benefits of digital technologies for learning. For example, they are motivating for learners (Cavendish et al., 1997), and their value is recognised in numerous reports (e.g. Rose, 2008; Johnson, 2005; Green & Hannon, 2007; Underwood et al., 2007). However, there is an argument that the optimistic rhetoric that supports educational use of digital technologies is overblown and short of evidence (Cuban, 2001; Oppenheimer, 2003; Reynolds et al., 2003). A further challenge comes from concerns about how digital technologies are used in learning. For example, Harris et al. (2009) argue that current use of technologies tends to be focussed on skills required by teachers to integrate them into their classroom, rather than students' learning needs.

Most digital technologies in use in the classroom were not created as educational tools but have been adopted by educators for pedagogical purposes (Burden & Atkinson, 2008). The affordances of these facilities or devices are not defined by their features but by the way they are adapted and used (McLoughlin & Lee, 2007). McLoughlin and Lee give the example of blogging which involves the skills of typing and editing which are not affordances in themselves but allow other affordances of sharing and interaction. They go on to suggest that we observe the following affordances in social software; connectivity and social rapport, collaborative information discovery and sharing, content creation and knowledge information aggregation. This breadth of affordances that digital technologies offer brings new challenges for educators because they are not sufficient for effective learning to take place. To facilitate learning using digital technologies it is necessary for educators to develop an understanding of what these technologies can offer.

Research questions

The core question for educationalists was initially framed in terms of whether digital technologies have a positive impact on learning. This question has been answered in part by meta-analytic studies which show consistent but small gains in attainment associated with the use of digital technologies (e.g. Tamin, et al., 2011; Higgins, Xiao & Katsipataki, 2012). It can also be argued that this core question has been made redundant by events. Digital technologies are now part of how we learn and how we live. It is unthinkable in twenty-first century UK to imagine our lives without them. The question then becomes to discover how digital technologies are affecting learning and how they can be best utilised to boost this learning.

Further meta-analytic studies have focused on the barriers faced by institutions when they attempt to integrate digital technologies into learning, and then the strategies that they can employ to overcome these barriers (Hew & Brush, 2007). These barriers can be grouped around themes such as the structure of the institution, the learning environment, the assessment of learning and the attitudes of the learners.

The research questions then become, first, how can we best describe the learning environment that is experienced today by UK learners? Then, what are the features of this learning environment that are enhanced by digital technologies, and what impact are the digital technologies having on learning and learners?

These questions are explored in the papers submitted for this thesis and then discussed in the following sections.

2. Papers presented for the thesis

This thesis presents eight papers published between 2006 and 2014 concerning the impact of digital technologies on education. The thesis is based around a core paper (paper 1) which acts as a focus for discussion of the other seven papers presented here. For the papers where Banyard is not the first author, a statement is appended from the first author concerning contribution. A further 17 papers on learning and technology also contribute to the argument (see Appendix 1). The data for much of the argument is contained in 13 reports by Banyard and colleagues published by Becta and the British Psychological Society (see Appendix 1).

The total academic output of Philip Banyard has attracted over 1100 citations according to Google Scholar, including over 750 in the last 5 years The eight papers presented here have attracted 75 citations and the core paper (paper 1) has received over 120,000 viewings on the Open Education Europa website (http://openeducationeuropa.eu).

Core paper

1. Banyard, P. & Underwood, J. (2008). Understanding the learning space. *ELearning Papers, 9.* 1-12. Retrieved from http://www.openeducationeuropa.eu/en/article/Understanding-the-learning-space. (accessed 21.06.2014).

Further research outputs

2. Underwood, J. & Banyard, P. (2006). Learning and technology: A happy conjunction? In K. Steffans, R. Carneiro & J. Underwood (Eds.), *Self-regulated learning and technology enhanced learning environments* (pp. 64-71). Aachen: Shaker Verlag.

3. Banyard, P., Underwood, J., Kerlin, L., & Stiller, J. (2011). Virtual learning environments: Personalising learning or managing learners?. In M. Thomas (Ed.), *Digital education: Opportunities for social collaboration* (pp. 123-141). London: Palgrave Macmillan.

4. Banyard, P. (2010). Teaching the personal science: From impeccable trivia to the blooming buzzing confusion. *Psychology Teaching Review, 16(2),* 38-44.

5. Banyard, P., Underwood, J., & Ault, A. (2006). Do enhanced communications technologies inhibit or facilitate self-regulated learning? *European Journal of Education, 41(3/4),* 473-90.

6. Underwood, J. & Banyard, P. (2008). Managers', teachers' and learners' perceptions of personalised learning: Evidence from Impact 2007. *Technology, Pedagogy & Education, 17(3),* 233-46.

7. Banyard, P. & Underwood, J. (2012). E-learning: The dark side? *Elearning Papers, 28*. Retrieved from http://www.openeducationeuropa.eu/en/article/E-learning%3A-The-Dark-Side%3F. (accessed 21.06.14).

8. Banyard, P. & Duffy, K. (2014). Student representations of psychology in the UK. *Psychology Teaching Review, 20(2),* 110-120

3. A model of learning

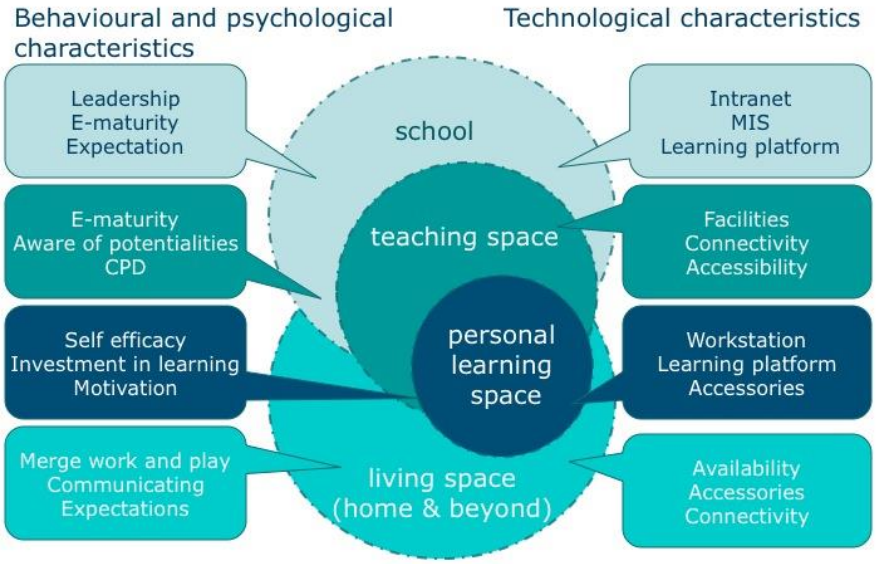
The model presented here was devised to represent the relationship between learners, the educational spaces they operate in and digital technologies (Banyard & Underwood, 2008). It provides a framework for exploring the questions raised by past research into the impact of digital technologies on learning. It recognises the changed way that we frame our world and our place in it. The model identifies four key spaces (personal learning space, teaching space, school space and living space) that have an impact on the educational experience of learners. These spaces are psychological rather than physical.

The first iteration of the nested model viewed the learners' experience as being structured by the teachers who are themselves working with and contributing to the culture of the school. However, on reflection, it is more helpful to consider the personal learning space that the learner occupies rather than the learner himself or herself. Put simply, the personal learning space is the space in which learning takes place. This can have some obvious physical characteristics (such as the classroom or the technical facilities that are available) but crucially it also refers to the cognitive space in which the learner operates. This cognitive space includes the learners' investment in learning, their sense of efficacy and their motivation to learn. In the same way, it is helpful to consider the teaching space rather than the teacher. The teaching space includes the physical environment of the classroom and the cognitive structures that generate the learning environment. In the case of teachers the additional cognitive features include their awareness of the potential of digital technologies and their own level of e-Maturity.

In the third iteration of the Model (Figure 1), and the one that is presented here the space beyond the school also becomes significant. This living space provides a further input to the learning space and teaching space. Teachers create some of their teaching materials outside the school using resources that might not be available within the school. They might also belong to networks of teachers from other schools who are sharing good practice. Similarly the learners' personal learning space is not limited to the school. They might have access to other technical resources and social resources outside the school. Space in this model is partly defined by its physical characteristics and technical specifications. It is only fully understood by considering how people behave in that space and how they think about that space. A paved square can be a piazza if people are sitting at tables drinking coffee or it can be a parade ground if soldiers are marching on it.

The following sections of this thesis explore questions around the impact of digital technologies on learning using this model as a framework for these discussions.

Figure 1. Learning Spaces Model



4. Populating the model

This section uses the papers submitted for this thesis along with research reports to populate the model outlined in the previous section and to demonstrate the contribution that has been made to the arguments around the impact of digital technologies. It reviews each of the four learning spaces and considers how they contribute to learning and achievement.

The school space

It is well established that economic factors are key predictors of educational performance (e.g., Sharples, et al., 2011; Demos, 2013; Noden & West, 2009). A re-analysis of the data from Impact 2007 (Underwood et al., 2007) and Impact 2008 (Underwood et al., 2009a) for this thesis (see Appendix 2) shows the predictive value of key economic indicators. The proportion of children eligible for free school meals and the proportion of unauthorised absence are both powerful predictors of school performance at national tests in primary and secondary schools. When combined with the other school environment factors of ACORN data and the proportion of learners with a SEN (Special Educational Need) statement the variables were able to account for a substantial amount of the variance in the test scores in primary (56%) and secondary (41%) schools. The regression analyses confirm the impact of the school environment on Key Stage performance as shown in previous research (Gorard, 2012). In both primary and secondary sectors we observed correlations between indicators of deprivation and performance at Key Stage tests. Deprivation is therefore a key predictor of performance for a school in national academic tests. The gap in achievement between schools in areas of disadvantage and the rest of the sector has been resistant to interventions and remains a government priority (DfE, 2011).

Within the constraints of these economic variables schools are able to create a space that enhances learning and achievement. One way of exploring the impact of digital technologies has been to estimate the e-maturity of the school (Underwood & Dillon, 2004), and using this measure the Impact reports found mixed results (Underwood et al., 2004, 2007, 2009a). The Impact 2007 report found a weak relationship between the overall performance of the schools in terms of their Key Stage Test results and measures of e-Maturity. Within this data, however, there were some stronger relationships, for example at KS3 there was a measurable and significant relationship between e-Maturity and measures of school performances at Maths ($r = +0.45$, $p < .01$), and Science ($r = +0.40$, $p < .01$). Impact 2008 found that e-Maturity of the school was a weak positive predictor of performance though the importance of institutional maturity was dwarfed by the impact of the learner focused factors, such as engagement, which are discussed below.

An analysis of four years data from the Harnessing Technology surveys in Further Education colleges (Banyard & Murphy, 2009, see Appendix 3) also found only weak associations between e-maturity and performance indicators such as achievement and retention. The one indicator that did relate to e-maturity in a college was their Ofsted report. In 2 of the 3 years for which there was data available, the analyses showed moderate to strong relationships between the two variables. In other words the e-mature colleges received better Ofsted ratings on most of the criteria used in the reports.

As part of their e-maturity, schools create technological facilities to manage and promote learning. For example, we observed a secondary school in the east of England which cooperated with a software company to produce a system for monitoring conduct of learners across the school (Banyard, et al. 2011). The *ibehave* system (now marketed as IsisBehave) allows teachers to record and access the incidents of good and bad behaviour by the learners and the system also generates automatic feedback to parents about their children at the school. The *ibehave* system has been marketed to local schools and the income from these sales is helping to fund other IT initiatives in the school. This facility and similar systems are transforming the management of information in schools and offer the potential to transform the relationship between the teacher and the learner (Banyard, et al. 2011).

During the first decade of this century there was a drive to introduce virtual learning environments (VLEs) in UK schools (Becta, 2004), a policy outlined in the UK Government's 2005 Harnessing Technology strategy paper (DfES, 2005). There is, however, a gap between the perceived potential of technology and its actual use. Using interviews with teachers to devise an instrument to capture this gap Banyard et al. (2011) identified three main fields of use for the VLE: curriculum development, communication, and administration, and further identified some key functions under each of these headings. The list of key functions was then used as a stimulus for discussion with teachers, who were asked to identify the potential uses of a VLE with the help of the list but with the clear understanding they could add further functions should they wish to. Once they had identified the potential uses that their school's VLE was able to support, they were asked to provide a statement of which of these functions they actually used. This instrument showed that the VLE was not being used to anything like its potential (Banyard et al., 2011; Underwood & Stiller, 2014) – like buying a Ferrari to get your shopping from Sainsbury's.

The teaching space

The teaching space provides an environment for students that includes the cognitive structures that generate the learning environment as well as the facilities of the classroom. In the case of teachers

the additional cognitive features include their awareness of the potential of digital technologies and also their response to educational initiatives such as personalising learning and the drive to create independent learners.

In the research reported for this thesis, the teaching space was captured through a range of techniques including interviews and focus groups with teachers, surveys of teachers, observations of teaching sessions and learners' self reports of their learning and how they were being taught. These data are reported in the papers submitted for this thesis, the data reanalysed for this thesis (see Appendix 2) and the reports submitted to Becta (see Appendix 1)

With regard to personalising learning, it is clear that the concept has different understandings for learners, teachers and school managers (Banyard & Underwood, 2008; Underwood & Banyard, 2008). Although teachers generally expressed support for the personalisation agenda, support was greater in primary schools than in secondary schools, and within secondary schools there were big differences between subject specialists (Underwood & Banyard, 2008).

Teachers' perceptions of the strength of personalised learning in their school (example item, *"In my school I am encouraged to agree targets with pupils")* was strongly related to measures of the IT resources available in the school (Underwood & Banyard, 2008). Counter-intuitively, the VLE which can be seen as a vehicle to deliver personalised learning was not highly valued by teachers. A survey of over 300 teachers (Banyard, et al., 2011) asked them to identify their most important pieces of technology. Over half identified their Interactive Whiteboard as their "must have" technology and a further quarter chose their laptop. There were mentions for Google, YouTube, and data-sticks but very few for the VLE.

More recently the political debate has moved on to consider the need to develop independent learners. One of the drivers for recent educational reforms in the UK has been the perception that students struggle to manage their own learning. For example Michael Gove (then Secretary of State for Education) said in an interview with The Times "*Universities are reporting to me that students are arriving ill-prepared for independent learning."* (Isaby*,* 2011*).* This concern has been fuelled by reports such as *Fit for Purpose* (Ofqual, 2012) that raised concerns about the skills students develop during their secondary education. Doubts have been raised about whether current curricula can prepare students for the independent learning required in universities and in work (Kotecha, Inge & Leighton, 2010). It is argued that the modular basis of much of the secondary curriculum leads to students "learning the test" at the end of that module rather than learning the subject as a whole (e.g., Green, 2007; Hayward & McNicholl, 2007).

The concept of independent learning is associated with a number of similar concepts such as personalisation, student-centered learning, ownership of learning and self-regulated learning (Banyard, Underwood & Ault, 2006; Meyer, et al., 2008; Underwood & Banyard, 2006; Underwood & Banyard, 2011). A key part of all these is the sense of autonomy that a student can achieve over their learning. Perceptions of autonomy are positively associated with three key motivational variables; interest, goal orientation and self-efficacy (Lüftenegger et al., 2012). The competent learner is able to attain desired outcomes from optimally challenging tasks. Ideally these behaviours will be expressed in an environment that permits choice, a feeling of being the initiator of one's own actions (autonomy) and facilitates social interaction (relatedness) (Baard, Deci, & Ryan, 2004).

Digital technologies potentially provide a vehicle for promoting self-regulated learning and independent learning. Evidence from the Impact studies showed examples of learners demonstrating a range of personal decision-making and organisational skills in completing their online tasks (Banyard, Underwood & Ault, 2006). These and other examples showed how learners were able to manage their own learning environment (Banyard, et al., 2006).

So, is independent learning promoted within the teaching space? The reanalysis of data prepared for this thesis (see Appendix 2) challenges this. Self-report measures across the school years show that learners perceive their learning as less challenging as they move through the school years and they also report less support to develop their sense of autonomy (see Appendix 2, figure 1). Similarly, their perceptions of self-efficacy and their persistence also decline. They also place less value on their own learning as they advance through the school system.

Corpus and her colleagues (2009) also note age-related declines in intrinsic motivation. However, they argue that these deleterious effects can be minimised by a school-wide focus on mastery goals. Such mastery learning is apparent in the UK, where the introduction of modular assessment with opportunities to re-sit modules in national examinations has resulted in improved scores and a dramatic rise in overall pass rates (Smithers, 2011). Here the focus has been to encourage students to repeat work until they master key performance criteria. The effect on schools and teaching has been amplified by the use of these examination results to evaluate schools and create league tables of school performance. It has therefore become strategic for schools to focus on students at the borderline of the league table criteria and ensure that they reach minimum standards.

The data presented here, however, question whether this mastery has been at the expense of student engagement. The decline here is indicative of a learning strategy in schools that does not provide sufficient challenge and does not encourage independent working and the growth of

autonomy. It is indicative of a strategy that lowers students' self-evaluation of their abilities and performance. It is also indicative of a response by teachers to the perceived pressure to obtain good results on Key Stage tests that leads to strategies that do not promote personalised learning and do not promote independent learning.

In collecting data for these reports a school was observed that identified learners who were performing just above or just below the key criteria and resourced them with extra lessons and extra facilities (including a free laptop) in order that they could achieve on the national tests (Underwood et al., 2010). This illustrates the strategic approach taken by schools to achieve defined baseline criteria for results on national tests.

Indeed, the reanalysis of data conducted for this thesis shows a negative impact of teaching environment variables on academic performance (see Appendix 2). So when the teaching is rated as not promoting autonomy, test scores are higher. When the variables are added to the enhanced regression model they increase the power to predict academic performance (50% of the variance) and the picture that emerges is that schools improve their academic performance with less autonomy and less student focused support. These data provide some support for the suggestion that schools (Corpus et al., 2009) and pupils (Könings et al., 2011) are able to boost performance by limiting autonomy but this comes at the cost of a decline in learner perceptions of the quality of the learning experience.

The learning space

The personal learning space of a student includes cognitive factors such as their approach to learning, motivational factors such as their engagement with learning as well as the facilities that are available to them such as the learning platform. In the research reported for this thesis the personal learning space was captured through a range of techniques including classroom observations, focus groups, photo-elicitation and on-line surveys.

In the learning space it is clear that digital technologies enhance the motivation of learners. For example, in a rural ex-mining village with ongoing industrial decline and relatively low educational achievement and expectation a secondary Deputy Head commented on the unusual respect shown for the ICT facilities and equipment by the pupils. His measure of this was that there had been "no mouse balls nicked". In a school where resistance to education was high this indicator of involvement

and respect for education is not trivial. Other schools also reported a decrease in unacceptable behaviour when pupils were using ICT equipment (Banyard, et al., 2006).

One reason for this increased motivation and respect comes from the activities that digital technologies afford. For example, a class was observed in an inner London primary school with a challenging catchment of children with 67% receiving free school meals (nationally 17%) and 57% with English as an additional language (nationally 8%). Learners were required to use information from a website and from their observation of science experiments in previous lessons to respond to a worksheet which was displayed on their screens. They were able to attempt a sophisticated task that would have been difficult to achieve using conventional resources (Banyard, et al., 2006).

In the UK, secondary education for many children is a process of resistance and subversion (Corrigan, 1979). Some of these activities can have a positive benefit for the learner, so for example, secretly listening to music over the internet made the lesson more enjoyable but did not appear to interfere with the work (Banyard, et al., 2006). This resistance has also come to the fore in studies of learning in virtual space (Twining, 2010).

Across the focus groups a number of pupils identified their data stick as a 'must have' tool. Their reasons for this were generally pragmatic in that the stick allowed ease of transfer between home and school, so was great for homework, and file sharing between friends. One Year 9 learner, however, said that he favoured the data stick because "school can't steal it" – 'it' in this case being his data. He could bring material to and from school without it being tracked, thus maintaining his privacy and independence. This made the data stick preferable to the VLE, which had echoes of Big Brother in this young man's eyes (Banyard, et al., 2006). In these activities the learners are redefining the learning space (Banyard, et al,.) and becoming adept at using the digital toolkit to support both their internal mental space and thinking (Mayer, Dow, & Mayer, 2003)

With regard to the motivational aspects of the learning space, it is recognised that engagement is a problematic variable as there are many definitions and many measures (Appleton, Christenson & Furlong, 2008). Part of the issue is that engagement is commonly considered as having two dimensions, social and academic. Digital technologies provide the facility to boost social engagement though research indicates that this does not have a positive effect on academic engagement (Wise, et al., 2011). The research reported here focused just on academic engagement and coupled it with a measure of the value that learners put on their education.

The reanalysis of data produced for this thesis (Appendix 2) investigates what are the motivational patterns of learners across the school years and what are the perceptions that learners have of their

own learning and the way they are being taught. The measures of the student learning space show that their sense of efficacy and persistence decline during their school careers, indicating a reduction in confidence and a move away from independent learning (see Appendix 2, figure 2). Also, during their school career we observe a decline in the value the children place on their education though this does level out when they start studying for their GCSE examinations in years 10 and 11 (see Appendix 2, figure 3).

The sense of value that learners have for their learning will come from personal factors, from factors in their lives away from school but also from the teaching environment and the school environment. In the reanalysis in Appendix 2 we tested the relationship of this sense of value with the school space and teaching space variables. For both primary and secondary learners the bivariate correlations between value and these other factors are strong. The analyses of the regression models show that we can use the school and teaching space variables to predict the sense of value of primary learners (39% of the variance) and secondary learners (62% of the variance). This shows the inter-relatedness of the school and teaching spaces with the learners' personal learning space.

Studies of the personal learning space show a conflicting picture of extended possibilities but restricted ambitions. One clear finding is that the learning space is developing a greater overlap with the living space, and this is a place where the learner has greater control.

The living space

The living space is where learning occurs outside of the school and which also impacts on the learning in school. The importance of this living space for learners has further eroded the boundaries between work and play. In the research reported for this thesis the living space was captured through focus groups and on-line surveys.

Learners in 21st century UK have developed new skills to deal with digital technologies, for example children as young as five years of age have been observed happily working with digital cameras and editing photos to produce their own web pages, while in the secondary sector pupils are producing home movies and composing and recording music (Underwood, Dillon & Twining, 2007). In the research reported here (Banyard & Underwood, 2012) a class of 27 four and five year old children was observed logging on to their laptops and developing new versions of the song 'Twinkle, twinkle little star' for a full hour despite having very limited reading and writing skills.

Further, communication has been transformed through the internet giving rise to weblogs, YouTube, Facebook and Twitter. Mobile phones are seen by young people as 'a vital tool for young people's

social lives' (Haste, 2005:2) as is illustrated by the fact that more than half of her national sample texted friends more than five times a day. This behaviour is in line with Dunbar's (1998) social brain hypothesis concerning the importance of verbal grooming in humans as a means of strengthening bonds through verbal interchange that carries little meaningful content. As Green and Hannon (2007) point out, pupils are connecting, exchanging and creating in new ways; ways which their parents and teachers are certainly less adept and not always comfortable with (Banyard, et al., 2006).

Focus groups with learners at all four Key Stages revealed a snapshot of their digital worlds (Banyard & Underwood, 2008; Underwood, et al., 2008). For example, analyses of card sorts were used to populate visual representations of their digital worlds (see Underwood, et al., 2009a figure 4, see Appendix 5). The figures show how the learner's digital world develops so that by Key Stage 4 the learner is immersed in a rich technological world. At the centre of this world are the communication facilities and devices which are used as expressions of identity. This rich digital world of the learner outstrips the digital facilities of schools (see Banyard & Underwood, 2008, figure 2) which further blurs the boundaries of the learning spaces.

The focus groups also highlighted a generational divide in the use of digital technologies. For example, one group of Year 2 learners seemed aware that their time with technology offered an avenue to independence, with an opportunity to develop their secret (or independent) lives. There were several comments about sites that their parents or teachers would not know about or maybe understand. The unknowingness of adults seemed to be amusing or embarrassing to them (Underwood, et al., 2009a).

The behaviour of young people in the digital world has created a number of moral panics including the negative impact of violent video games (Anderson & Bushman, 2001), the impact of digital technologies on conduct behaviour (Palmer, 2006), the opportunities for plaigiarism (Underwood & Szabo, 2004), pathological internet use (Niemz, Griffiths & Banyard, 2005) and the emergence of technological addictions (Griffiths, 2013). Opposing this dystopian view is the role that the internet plays for young people in mediating information on sensitive issues (Borzekowski & Rickert, 2001). This confirms research showing the disinhibiting effect of the internet and the increased willingness to seek out information on embarrassing issues on-line when compared with the telephone or face-to-face communication (Joinson & Banyard, 2002; 2003). Furthermore there is the potential for learners to experience a level of individualised learning and self-development at a level unknown to previous generations (Durkin & Barber, 2002; Gee, 2003). For a review see Underwood, Banyard and Davies (2007).

A recurrent metaphor concerns the 'dark-side' of the internet which draws on ancient and modern myths about the nature of good and evil. This can be viewed in the context of earlier moral panics about the young (e.g. Corrigan 1979; Cohen, 1973). A key feature for the development of this current panic is a knowledge divide between adults and youth that has developed concerning the use of digital technologies. Digital natives (see below) are able to change the power balance of our society: this threatens the status quo and therefore has created a moral panic (Banyard & Underwood, 2012).

Digital technologies are an integral part of learning in the 21st century and, in fact, a major facilitator for the smooth running of everyday life. For example, communication technologies are at the heart of many social interactions, from the trivial to the life changing (Selwyn & Facer, 2007). One issue that arises from this is whether people have equal access to these key technologies and whether there is a digital divide developing (DfES, 2005). This observation brings us full circle to the discussion of the school space where economic factors were identified as key to achievement in education. Digital technologies provide the opportunity to transcend this divide but also to enhance it.

The boundaries between the spaces

The people occupying the school, teaching and learning spaces have different experiences of digital technologies (Banyard & Underwood, 2008). For school managers, digital technologies offer opportunities for greater control and recording of information. For teachers they offer opportunities for classroom management and for personalising learning. For learners they offer learning tasks that are motivating and also opportunities for subversion. The digital divide between teachers and learners is a reality and matches a similar divide between learners and their parents.

The issue of assessment highlights the permeability of the spaces. The example of A-Level Psychology (see appendix 4) shows how the subject matter of assessment can be driven by the learners. The growth of A-Level Psychology over the last twenty years has been market driven and this has altered the secondary curriculum (Banyard & Duffy, 2014), and this has led to a growth in psychological literacy (Boneau, 1990) in the general population as upwards of 2 million people now hold a qualification in the subject (Banyard & Duffy, 2014). This growth in school psychology courses has inevitably led to the employment of many hundreds of psychologists in schools who then contribute to the general working of the school and have an effect on the core curriculum. In this way the choices of the learners have permeated upwards to influence the teaching and school spaces.

A further issue concerning the role of assessment in learning is whether it can capture the learning that is developed through the use of digital technologies. This is among the issues covered in the next section on the challenges and opportunities for digital technologies in learning.

5. Challenges and opportunities for the use of digital technologies in learning

This section draws together the issues raised by the research and considers them within the structure of the learning model.

The school space

The structure of the school learning space is affected by government policy and performance targets. At government level there is concern in the UK about the results from national and international testing, and these results form part of the news agenda about education. One key national measure is performance at GCSE examinations. The UK government has set minimum standard performance targets for all schools (gov.uk, 2013). The data published in 2012 shows that around 200 secondary schools failed to meet these minimum standards, that is some 180,000 learners were in failing schools (Paton, 2013; Department for Education, 2011). The international data from PISA (OECD, 2010) show that the UK is ranked 25th, 28th and 16th in the world for reading, maths and science respectively. For all three measures this is a poorer ranking than in 2006. These data contribute to the concern about schooling in the UK (Shepherd, 2010). Given the investment in education and digital technologies the challenge for research is to uncover what is happening in schools and explain this relatively poor performance.

There is evidence that learners and schools will act strategically to both maximise scores on standardised tests and also to gain greatest benefit from those scores. For example the impact of a new rule for college admissions in one US state, which gave preference to students who were placed in the top 10% of students in their school, had a profound impact on students' school selection. The strategic choice was now to select a school with fewer high performing students to ensure being in the top ten percent. As a result there was a noticeable shift of good students to moderately performing schools (Cullen, Long & Reback, 2005). There was also evidence that schools were able to boost scores on standardised tests in the absence of general improvements in knowledge and ability in the subject areas associated with the tests (Cullen & Reback, 2006). Another change that indicates schools are attempting to boost their ranking in the national league tables has been the decrease in the number of students entered for the more academic GCSE examinations and an increase in those entered for vocational NVQs (National Vocational Qualifications) which can carry double and even quadruple weightings for those league tables (Richardson, 2012; Wolf, 2011). The evidence suggests, then, that a key driver for school is the outcome of national tests.

The research reported here that was carried out for Becta over a ten-year programme initially sought to measure the impact of digital technologies on pupil performance in schools (e.g. Banyard, et al., 2006; Banyard, et al., 2011; Underwood & Banyard, 2008). Although the research was able to show that practices of teaching and approaches to learning were changing they were unable to connect these innovations to improved academic performance. One explanation for this lack of a measurable effect centres on the measurement tools that are selected for the purpose. Traditional testing of academic performance is still largely based on techniques and types of learning that are independent of the new technologies. As a consequence they are not able to capture the impact of these technologies and so a lot of learning remains unassessed and unreported (Banyard, 2010).

Formal assessments in the UK are still largely conducted using traditional (i.e. pre-digital technologies) techniques, and focus on traditional (i.e. pre-digital technologies) academic skills. The origin of these techniques in UK education can be traced back through the University of Cambridge Local Examinations Syndicate (UCLES) to 1858 when a group of academics were invited by some Durham schools to develop assessment techniques for their pupils. The lessons were observed in order to capture how the pupils were being taught. Tests were devised to match the teaching and learning that was taking place (Banyard, 2010). The techniques for external examination are largely the same today even though the style of teaching and learning has moved on dramatically.

In many current learning programmes, when learners are doing coursework they are required to create their work digitally using the technology of the computer and the writing style of draft and edit. This in part mirrors their learning. In their examinations however, they are assessed using the technology of the Biro using a writing style that is unique to the assessment process. What validity can we claim for this process? The assessment does not match the learning and does not even relate to anything that they will be required to do when they leave school or university. It is indefensible but endlessly defended (Banyard, 2010). And to make matters worse, the latest reforms have abolished coursework for most subjects including STEM and require assessment by end of course examinations (Banyard, 2014).

The teaching space

Assessment provides a conflict for teachers because it fulfils two functions; first to provide feedback to the student of their progress and secondly to rank them against criteria of achievement. In addition, the results of the tests are used to assess the teacher. The strategic teacher, then, will focus on teaching to the test (Halonen et al., 2003) to the exclusion of tasks that will encourage independent learning (Banyard, 2010).

One of the potential hazards of a personalisation agenda is the possibility of using a style of personalised learning that is synthetic (Fairclough, 2001), for example using the affordances of digital technologies such as mail merge to personalise messages that are produced for a mass audience. In our everyday life we see through this and recognise the personalisation as synthetic and it would be reasonable to assume that learners can also see through this 'personalised' learning (Banyard, 2010).

This concern about the teaching space stretches beyond the school sector into higher education. Writing about the teaching of psychology in the UK, Gale (1990) argued that

> … we produce passive learners, respecters of authority, and students whose primary purpose in learning is negative reinforcement and the removal of anxiety … (1990:483)

His solution was to suggest that we create teaching sessions in the style of the primary school classroom. Gale was writing before league tables and targets but the point is still sound as it asks us to focus on encouraging learning through play and discovery. This echoes Vygotsky's (1978) idea that play is the main vehicle for children to develop their own learning and to develop their capacity for self-regulation.

To balance this negative view, the research reported here found numerous examples of teachers employing strategies that engaged students and developed their autonomy over their learning (see Underwood, et al., 2009a; Underwood, et al., 2009b). For example, on a personal learning and thinking day for Year 7, teams of learners were given a challenge to complete tasks such as ridding the school of litter. The teams researched the issue and created a five-minute PowerPoint to present their ideas in front of a panel of judges. Independent and personalised learning are still seen as important by schools and in the case of the litter example school managers argued that activities like these are important and exciting for learners, because learners get out there and do it for themselves (Underwood, et al., 2009b).

The VLE is a key tool of the teaching space but perhaps it is not the most effective way of promoting independent and personalised learning. The rise of social software (McLoughlin & Lee, 2007) means that learners are able to personalise their learning outside of the structures of their schools and colleges. The answer proposed and enacted by Holah and Davies (2009) is to use the range of opportunities provided by Web 2.0 digital applications. An example of the power of this approach is a community of practice (Wenger, 1998) facilitated by Holah and Davies for teachers of psychology (see Banyard et al., 2011). This approach creates an open system that encourages learners to explore in contrast to a closed system such as a VLE which encourages learners to work with only the given materials.

The living space

An issue about behaviour in the living space concerns digital natives and digital tourists (Prensky, 2001). Prensky argues that

> The single biggest problem facing education today is that our Digital Immigrant instructors, who speak an outdated language …, are struggling to teach a population that speaks an entirely new language. (Prensky 2001:2).

The process of labelling a generation as being fundamentally different is not new, for example babyboomers and Generation X (Bennett & Maton, 2010). It is, however, too simplistic to suggest a typology that divides us into digital natives or digital immigrants (Saligan, et al. 2010) and the creation of additional types for example digital settlers (Palfrey & Gasser, 2010) and digital tourists (Toledo, 2007) has not added to the discussion. Moving beyond the issues with rigid typologies however, Prensky' metaphor directs us to the technologically rich worlds of the young person (their living space) and to consider how this impacts their learning and everyday life. This rich world is evidence in the research presented here (Banyard & Underwood, 2012; Banyard et al., 2011).

One suggestion for the impact of digital technologies on these digital natives has been that they will develop different strategies of thinking and working. For example, bricolage may be strategic or even necessary for using digital technologies effectively (Turkle, 1995). Bricolage ''can be taken to mean 'trial-and-error,' learning by poking around, trying this or that until you eventually figure it out" (Papert, 1996, cited in Kolikant, 2010:1384). It can be argued that digital technologies have created a shift in what we consider to be appropriate and effective reasoning from a linear and abstract style to bricolage (Brown, 2000). But if this is the case, where can we find evidence for it?

Some studies (for example, Margaryan, Littlejohn & Vojt, 2011) find no evidence to support suggestions that the current generation of students use very different learning styles, show new forms of literacies or use digital technologies in more sophisticated ways. The research reported for this thesis, however, did find numerous examples of learning activities that were facilitated by digital technologies. Also the recent Ofcom survey (Ofcom, 2014) claims that 12-15 years olds in the UK are developing different communication habits even compared to 16-24 year olds, and they are the most technologically savvy of all the age bands.

The behaviour of young people in the living space is always changing and driving the bottom-up development of new technologies. For example, texting was a biproduct of mobile phone technology but young people discovered it as a means of communicating cheaply and from the first message

being sent in 1992 it developed to the point where 7.4 trillion texts were sent in 2011 (Gayomali, 2012). Currently there appears to be a move away from Facebook especially by the young (Garside, 2013; YouGov, 2014) as new means of communicating become more popular. People find new uses for technologies and make them their own but then move on. Perhaps it is better to describe these technology users as digital nomads rather than digital natives.

The digital nomad metaphor encompasses the democratising nature of digital technologies. Although there are scares about privacy for example with Google (Fioretti, 2014), the manipulation of users such as the Facebook experiment (Booth, 2014) and attempts by, for example, the US Military to flood social media with false identities (Fielding & Cobain, 2011), the digital consumer retains control and can migrate to new areas of the internet. They can create new online communities, comment on things and events, and contribute to this new democratisation by seeing the comments of others (Banyard & Underwood, 2012). We are also witnessing a new relationship with property, so where we used to buy music and books and films we are now able to stream them. They are available to us but we don't need to own them individually.

Alongside this democratising aspect of digital technologies, however, is potential to reinforce existing structures and power relationships. There are two dangers here, first as Paulo Freire points out technology can be used "to reduce the oppressed to the status of 'things'." (Freire, 1973: 133), and secondly by the creation of digital divides between those who have access to the technologies and those who don't. The research reported here explored aspects of these digital divides (Underwood, et al., 2009b) and this is an important area for future research.

The learning space

What is happening in the learning space? Are we seeing changes in how people learn and how they organise their everyday life? One change that gets general agreement is the effect of digital technologies on motivation. Learners' engagement with their learning is enhanced by digital technologies (Bolliger, Supanakorn & Boggs, 2010; Higgins, Xioa & Katsipataki, 2012). This was a consistent finding in the research projects reported here and in many other studies. What needs further explanation is the nature of this motivation. It may be, for example, that the use of digital technologies engenders a sense of flow (Csikszentmihalyi, 1997). Beyond the effect on motivation there is less general agreement about the impact of digital technologies on the learning space.

There is a debate about the impact of digital technologies on cognitive abilities. The new skills of screen-based activities such as searching, information retrieval and social networking can be argued to bring enhancement or damage (Carr, 2010). The immersion in digital technologies can bring a new

set of competencies but does it also bring a companion set of incompetencies? Is Google, in fact, making us stupid? (Joint, 2011).

The concern about the use of digital technologies is, in part, that learners use them to manipulate information rather than consider and analyse it (Wood, 2003). If we look at the traditional learning and assessment process, however, we see the principal task as being to pass knowledge from a book or lecture notes to the brain and then repeat than knowledge in an essay based examination. There is not a sophisticated learning task. Digital technologies in contrast allow us to facilitate the learning through the widest range of tasks many of them driven by the learner and so encourage the learning by experience proposed by Rousseau (1762).

Furthermore people can use technology to extend themselves in a physical way, most recently for example using exo-skeletons in construction work, (Hodson, 2014) and also to extend their cognitions and sense of self. Digital technologies, and in particular mobile phones allow us to extend ourselves in relation to others (Gergen, 1994). The mobile phone becomes an important extension such that when parted from it we can feel lost or threatened (Dittmar, 1992). Humans appear to be 'natural born cyborgs' (Haraway, 1991) who can use technology as if it is part of them. Staying with the mobile phone, it is used to store data such as images, texts and songs along with apps and the connectivity that it affords us. As such it acts as our external hard drive.

The learner can extend their cognitions by using digital technologies. The extended mind thesis (Clark, 2003; Clark & Chalmers, 1998) questions the boundary between the mind and the environment and argues that mind can extend beyond the confines of the human brain. The use of a calculator, for example, couples that device to the thoughts around the calculation being attempted. The extended mind thesis argues that this coupled arrangement can be seen as a cognitive system.

The ways that cognition will be extended will depend on the digital technologies that are available. Currently these technologies perform important functions for searching information, processing data, recording data and connecting with people. These functions are part of how learners make sense of their world, and this further highlights the way that formal assessments are dissociated from learning and are no longer fit for purpose. The pressing questions for research into the learning space concern how the extended self and extended cognition facilitated by digital technologies are utilised by learners.

The research reported here has highlighted the richness of the personal learning space and the adaptability of learners to digital technologies. Perhaps what we are witnessing is not a new

generation of learners with different skills, our digital natives, but another example of the human characteristic of adaptability and resourcefulness.

6. Conclusions

Over the past twenty years digital technologies have provided opportunities and challenges for education. They have also provided the stimulus for a discussion about what learning should look like and how it should be encouraged. The research presented for this thesis highlights the challenges and opportunities that digital technologies provide for learning. The following conclusions can be drawn from the research;

1. There is an ongoing tension between, on the one hand, the drive for instructional learning that provides a set curriculum for all learners and measures achievement of individual learners and schools through standardised tests, and the other hand, the drive "… to tailor education to individual need, interest and aptitude so as to fulfil every young person's potential" (DfES, 2004).

The papers presented here highlight this tension and provide evidence for how it has been played out in the development of personalised learning (Banyard, et al., 2006; Banyard et al., 2011, Underwood & Banyard, 2008). These papers tease apart the complexities of the personalisation agenda and contribute to our understandings of the potentialities and hazards of digital technologies in creating student-centred learning.

2. Digital technologies have the potential to transform learning (Underwood & Banyard, 2006). The papers presented here provide examples of this transformation, for example showing how digital technologies can lower or remove barriers to achievement created by fluency in language (Underwood et al, 2009). They also illustrate how digital technologies facilitate a change in the relationship between teacher and learner (Banyard & Underwood, 2008).

3. The learning space of the young has been enriched through the use of digital technologies. The material they have access to is immeasurably greater than previous generations and so are the opportunities to use this material. The digital native metaphor (Prensky, 2001) is useful in highlighting this new relationship with digital technologies, though it might be more appropriate to view them as digital nomads. The control that learners can take of their learning space is an example of the democratising potential of digital technologies even in the face of the drive to greater centralised control using these same technologies.

The papers presented here have explored this learning space and highlighted the different perceptions that young people have of their learning and of digital technologies (Banyard et al., 2011). They present examples of many developments that are driven bottom-up and how teachers and managers are struggling to keep on top of these changes (Underwood & Banyard, 2008). The

conclusion from the research presented here is that it is learners who will populate and create the learning spaces of the future. And these learning spaces of the future will present a challenge to how we organise our education and how we conduct our professional lives.

4. Digital technologies bring hazards as well as benefits. Concerns have been raised about the opportunities for plaigiarism (Underwood, Banyard & Davies, 2007), pointless clicking (Wood, 2003), pathological internet use (Niemz, Griffiths & Banyard, 2005), bullying and unwanted sexual solicitation (Banyard & Underwood, 2012), the sense of disinhibition created by the internet (Joinson & Banyard, 2002; 2003), digital divides (Underwood, et al., 2009b) and synthetic personalisation (Fairclough, 2001). There are also questions about whether Google is making us stupid (Joint, 2011) or violating our privacy and creating a digital panopticon (Fioretti, 2014).

The papers presented here highlight the perceived dangers of digital technologies and how learners are able to deal with these dangers and use these technologies to create new ways of communicating and new ways of being (Banyard & Underwood, 2008: Banyard, 2010). The papers make a contribution to our understanding of these modern dilemmas and how we can best resolve them.

5. The relationship between the use of digital technologies and academic achievement is not direct. The papers presented here confirm previous findings of a weak or non-existent relationship between the introduction of digital technologies, for example the roll-out of broadband, and the average performance of learners on standardised tests (Banyard, et al., 2006; Underwood, et al., 2005).

The papers also highlight and illustrate the flawed ambition of trying to improve scores on traditional measures using new technologies and new forms of learning (Banyard & Duffy, 2014; Banyard, 2010). The best assessments are those that model the learning that has taken place and if current assessments were able to model the learning that digital technologies afford then they may well demonstrate the value of these technologies.

Original contribution to knowledge

The value of the model is as a heuristic tool that shifts focus away from physical spaces and towards the social, behavioural and cognitive environment of the learner. Applying the model in this way within this thesis has enabled me to unpick the impact of digital technologies on learning. It is clear that these digital technologies do not have a measurable impact on learning outcomes when they

are assessed in standard ways such as Key Stage tests. There are, however, clear benefits to the technologies in that they can level the playing field for learners and make many learning tasks more accessible, for example, for learners with average or below skills in language.

A further benefit is the impact of digital technologies on power relationships such as teacher-learner. Learners are empowered through their greater familiarity and competence with the new digital technologies and through the special knowledge that this affords them. This means that learners can shape as well as be the recipient of learning and that they can drive bottom-up change. This process of democratisation of knowledge and learning inevitably encounters resistance and also the creation of moral panics.

The model presented here allows us to explore and demonstrate how digital technologies are changing learning. This can be seen in the transformation of the personal learning space where learners have almost limitless access to knowledge, where they are developing new skills, and new ways of organising knowledge, for example through bricolage. The model provides a framework for analysis of current changes in education and also a way of exploring the possibilities of future developments.

Going forward

The challenges for future research are to

- unpick the features of learning on which digital technologies have the greatest impact,
- further explore how young people adapt to the opportunities created by digital technologies for communicating, interacting and learning,
- explore how assessment can be adapted to capture the learning of young people that is afforded by digital technologies
- explore how digital technologies can be used to narrow the gaps in achievement.

The model presented here in the core paper (Banyard & Underwood, 2008) acts as a framework for the discussion about the impact of digital technologies on learning. It identifies the different spaces that we need to consider if we are to develop our understanding of this impact. It provides structure for the research that is required to further understand the intricacies of the relationship between digital technologies and learning and to further explore how we can work with these technologies to enhance the experience and achievements of learners.

Digital technologies are creating opportunities and new ways of learning. Expectations for the impact of these technologies are high in teachers and learners and in the wider society. These expectations can be unrealistic and see digital technologies as a magic bullet to solve many deep-seated problems within teaching and learning and within the wider society. Digital technologies clearly can not provide this change alone but like the invention of the printing press they create an opportunity to transform our relationship with knowledge and empower learners to take control of their own learning. Digital technologies are not the solution to our problems but they are the tools that we can use to address many of them.

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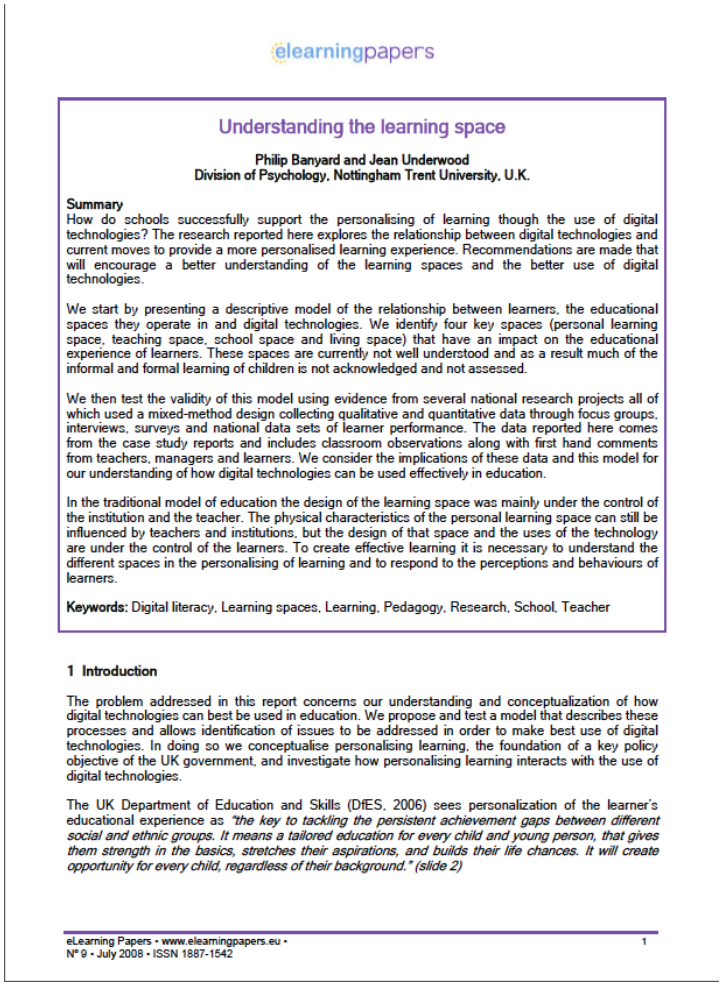

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Understanding the learning space

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Summary
How do schools successfully support the personalising of learning though the use of digital technologies? The research reported here explores the relationship between digital technologies and current moves to provide a more personalised learning experience. Recommendations are made that will encourage a better understanding of the learning spaces and the better use of digital technologies.

We start by presenting a descriptive model of the relationship between learners, the educational spaces they operate in and digital technologies. We identify four key spaces (personal learning space, teaching space, school space and living space) that have an impact on the educational experience of learners. These spaces are currently not well understood and as a result much of the informal and formal learning of children is not acknowledged and not assessed.

We then test the validity of this model using evidence from several national research projects all of which used a mixed-method design collecting qualitative and quantitative data through focus groups, interviews, surveys and national data sets of learner performance. The data reported here comes from the case study reports and includes classroom observations along with first hand comments from teachers, managers and learners. We consider the implications of these data and this model for our understanding of how digital technologies can be used effectively in education.

In the traditional model of education the design of the learning space was mainly under the control of the institution and the teacher. The physical characteristics of the personal learning space can still be influenced by teachers and institutions, but the design of that space and the uses of the technology are under the control of the learners. To create effective learning it is necessary to understand the different spaces in the personalising of learning and to respond to the perceptions and behaviours of learners.

Keywords: Digital literacy, Learning spaces, Learning, Pedagogy, Research, School, Teacher

1 Introduction

The problem addressed in this report concerns our understanding and conceptualization of how digital technologies can best be used in education. We propose and test a model that describes these processes and allows identification of issues to be addressed in order to make best use of digital technologies. In doing so we conceptualise personalising learning, the foundation of a key policy objective of the UK government, and investigate how personalising learning interacts with the use of digital technologies.

The UK Department of Education and Skills (DfES, 2006) sees personalization of the learner's educational experience as *"the key to tackling the persistent achievement gaps between different social and ethnic groups. It means a tailored education for every child and young person, that gives them strength in the basics, stretches their aspirations, and builds their life chances. It will create opportunity for every child, regardless of their background." (slide 2)*

Understanding the learning space

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Abstract

How do schools successfully support the personalising of learning though the use of digital technologies? The research reported here explores the relationship between digital technologies and current moves to provide a more personalised learning experience. We start by presenting a descriptive model of the relationship between learners, the educational spaces they operate in and digital technologies. We identify four key spaces (personal learning space, teaching space, school space and living space) that have an impact on the educational experience of learners. These spaces are currently not well understood and as a result much of the informal and formal learning of children is not acknowledged and not assessed.

We then test the validity of that model using evidence from several national research projects. These projects all used a mixed-method design collecting qualitative and quantitative data through focus groups, interviews, surveys and national data sets of learner performance. The data reported here comes form the case study reports and includes classroom observations along with first hand comments from teachers, managers and learners. We consider the implications of these data and this model for our understanding of how digital technologies can be used effectively in education. Recommendations are made that will encourage a better understanding of the learning spaces and the better use of digital technologies.

Key words

Digital literacy

Learning

Pedagogy

Research

School

Teacher

Introduction

The problem addressed in this report concerns our understanding and conceptualization of how digital technologies can best be used in education. In particular we want to propose and test a model that will describe these processes and therefore identify issues that need to be addressed if we are to make best use of digital technologies. Also we want to address the issue of personalizing learning which is a key policy objective of the UK government and investigate how that interacts with the use of digital technologies.

The UK Department of Education and Skills (DfES, 2006) sees personalization of the learner's educational experience as *"the key to tackling the persistent achievement gaps between different social and ethnic groups. It means a tailored education for every child and young person, that gives them strength in the basics, stretches their aspirations, and*

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builds their life chances. It will create opportunity for every child, regardless of their background." (slide 2)

There are many ways that digital technologies can support the learner to achieve a more personalized experience. In the Impact 2007 report (Underwood *et al*., 2008a) we found two trends: the rise of the learner as not only recipient but also shaper of the educational experience, and the growth in the range and availability of user-centred, mobile digital technologies. The synergy between these two developments has the potential to extend the range of and access to learning experiences with the possibility of delivering the curriculum in more imaginative and flexible ways. However, digital technologies do not in and of themselves lead to a more personalised learning experience. Indeed Impact 2007 showed a complex relationship between the e-Maturity (a measure of the level and effective use of digital resources of a school), and the degree to which a more personalised agenda was perceived by pupils to be operating in their schools.

Developing a Model of the Effective use of digital technologies for the personalising of learning

In order to design the model presented here we conducted a wide-ranging review of literature, projects and implementations to capture a picture of the current effective use of digital technologies for the personalising of learning. We have drawn on materials in the public domain as well as detailed classroom observations conducted under Impact 2007 (Underwood *et al*., 2008a) and earlier work from the Broadband Projects (Underwood *et al*., 2004 & 2005).

The model is a description of the interrelationships between core actors (the institution, the staff and the learner) and the functional spaces which they inhabit (Figure 1).

A number of assumptions underpin this model:

1. The educational process is a dynamic system governed by a complex set of interrelationships.
2. Learning occurs both in informal as well as formal settings and, after a period in the Twentieth Century when formal education dominated, the rise of digital learning spaces has rebalanced the importance of informal versus formal learning. Learners increasingly acquire not only 'street' knowledge but also 'academic' knowledge from outside of the classroom. In particular their technological world is likely to be richer outside the school than it is inside the school. As a result they have access to a range of resources and functionalities that allow for new ways of learning. These technological skills and new ways of learning can then be brought into the school and formal learning.
3. Technological advancements such as simulations, virtual reality and multi-agent systems have been not only a stimulus but also a driver of a more flexible and social conceptualisation of learning. This is captured in the moves towards just-in-time learning, constructivism, student-centered and collaborative learning.
4. A fourth assumption is that across the educational space there is the potential for children to take on multiple roles, which may include learner, mentor, tutor and in some cases assessor. Equally the teacher or tutor is also a learner in some contexts. While parents and guardians have their central role they are also tutors and learners. Each of these roles is important, as is evidenced from the Test Bed Project (Underwood, Dillon & Twining, 2007) where teachers' skills development was shown to be an important positive correlate of school performance. In contrast, Lim, Lee, and Richards (2006) have reported reduced usage of technology by pupils in classes where the teacher was uncomfortable with technology.

There have been three iterations of the model to date. In the first iteration the nested model views the learners' experience as being structured by the teachers who are themselves working with and contributing to the culture of the school. However, on

reflection, it is more helpful to consider the *personal learning space* that the learner occupies rather than the learner himself or herself. Put simply, the personal learning space is the space in which learning takes place. This has some obvious physical characteristics (such as the technical facilities that are available) but crucially it also refers to the cognitive space in which the learner operates. This cognitive space includes the learners' investment in learning, their sense of efficacy and their motivation to learn In the same way, it is helpful to consider the *teaching space* rather than the teacher. The teaching space includes the physical environment of the classroom and the cognitive structures that generate the learning environment. In the case of teachers the additional cognitive features include their awareness of the potential of digital technologies and their own level of e-Maturity.

In the third and current iteration of the Model (Figure 1) the space beyond the school also becomes significant. This *living space* provides a further input to the learning space and teaching space. Teachers create some of their teaching materials outside the school using resources that might not be available within the school. They might also belong to networks of teachers from other schools who are sharing good practice. Similarly the learners' personal learning space is not limited to the school. They might have access to other technical resources and social resources outside the school.

The second level of description captures the characteristics of the participants and also of the technologies. In this sense the affordances of the technology introduce further enhancements, such as the capacity to support group dynamics.

The living space that most commonly provides support for learning is the home, but opportunities for learning go much further than this. With regard to the home, the affordances of digital technologies create a reciprocal traffic with the school so that just as the school can now be in the living room, the people in the living room can look into and affect the school. Digital technologies have helped blur distinctions between work and play and now with increasing links between school and home they are also blurring the distinctions between leisure and learning.

Figure 1 About Here

In the Model, the first level of description focuses on four educational spaces: the school environment including aspects such as culture and affluence of the institution; the teaching space; the personal learning space and the living space. While pupils as learners find a natural home in the personal learning space, the research evidence shows they are becoming more active in the teaching space. Teachers of course necessarily occupy the teaching space but they also occupy the learning space as they seek to develop their pedagogic and out-of-school skills. The Model clearly underscores the importance of out-of- school spaces both for the acts of teaching and learning and also for those pupils and teachers, or indeed parents, as learners. Some teachers also contribute to the school space in their leadership or technology roles.

At first glance the nested model of educational spaces hides a discontinuity. Are the spaces closed or open? How permeable are the barriers between the spaces? How much of the infrastructure and strategy developed at school level is appropriate to the needs of teachers in the learning space? How much of the structure of the learning space maps onto the understandings and skills of learners in their learning space? In previous research (Underwood *et al.* 2008a) and the current research the responses of managers; teachers and learners do not share the same perspective on the personalising of learning, although all groups acknowledge technology has an important role in supporting the personalisation agenda. Aligning the perceptions from the different spaces is key to the delivery of the *Harnessing Technology* agenda.

The second level of description captures the characteristics of the participants and also of the technologies. In this sense, the affordances of such technologies - for example their

capacity to support group dynamics - create new opportunities for influencing how learning takes places. At this level the model also captures the behavioural and psychological characteristics that are key to the delivery of personalised learning. Space in this model is partly defined by its physical characteristics and technical specifications. It is only fully understood by considering how people behave in that space and how they think about that space. A paved square can be a piazza if people are sitting at tables drinking coffee or it can be a parade ground if soldiers are marching on it.

Validating the Model

Methodology

We have endeavoured to test the validity of that model using evidence from several national research projects including the roll out of broadband into UK schools. Detailed methodological descriptions are published in the studies identified above. In summary, the studies have reported on work carried out with UK schools over the last five years. The studies on the roll-out of broadband technologies in schools (Underwood *et al.,* 2004 & 2005) created case studies on 37 and 27 schools respectively. These case studies were derived from telephone and face-to-face interviews with school managers, ICT co-ordinators, and teachers and combined with classroom observations and review of learners' work to build a picture of the digital world of the school.

Most recently, Impact 2007 (Underwood *et al.,* 2008a) and Personalising Learning (Underwood *et al.,* 2008b)[2] have explored the relationship between personalising learning and digital technologies. The first of these studies again used case studies with similar sources of data with the addition of online survey of learners (n > 3000) and teachers (n > 500). The data from these surveys are reported elsewhere. The second project again developed case studies in 30 schools (primary and secondary) but used focus groups with teachers and learners in addition to the interviews with managers and ICT co-ordinators.

In addition to the data identified above these projects made analyses of demographic data and analyses of academic performance (reported elsewhere).

The following data are drawn from the reports and illustrate the emerging themes that we observed. Examples are included from case study reports and from interviews and focus groups.

1. How might the technology help?

Digital technology was seen as a central support for a more personalised learning experience but the nature of that support can differ greatly. For some schools the technology is being used to provide detailed feedback to pupils, staff and parents. Such feedback, not just on academic performance but also behaviour, supports pupils in their attempts to self-regulate their learning.

> *At one secondary school SAM Learning (a UK exam revision service for schoolchildren) and 'P by P' (personalisation by pieces) schemes foster group activities, independent learning and encourages pupils to present and discuss work in a positive way. The "P by P scheme" is fairly new but allows pupils to set their own goals, find evidence to build skill sets and are assessed by mentors and other peers (2 years above them) from other parts of the country*

The motivational power of technology is clearly recognised by teachers.

> *ICT enthuses and excites children; electronic tasks seem more exciting and stimulating in many cases. Although a good mix of computer activities and practical activities works best!*

[2] This series of projects was funded by Becta.

The teachers all felt that much of the children's work was better when a smartboard was used for teaching. They reported higher motivation and levels of interest. They gave examples of individual children such as L, who usually needed extension activities to stretch him, easily done on a computer. Using a computer gave the opportunity of presenting one idea in a wide variety of ways, this way the teachers were able to ensure practice without the children feeling that they were doing the same thing every time.

However, other schools use the technology in a more communal way as in this next example.

The school uses software called 'question wall' which is used outside of lessons to support understanding. For example, in a project on religion a question wall was set up on which pupils can pose questions, answer other peoples' questions, share resources etc. Teachers monitor it and also pose additional questions.

Many of our observations show the interplay of intra and internet use and confirms that there is a growing ICT skills base and a sophisticated etiquette of working among pupils in ICT rich environments.

A girl entered the classroom and logged onto the school intranet to continue working on a project which she began by reviewing her progress to date. She then logged onto the internet and, using a search engine, located a short list of useful sites. One particularly useful site contained some audio content and, not wishing to disturb other pupils she obtained a set of headphones from a technician. Having made notes from the audio files she then used these as a basis for her work, drafting and re-drafting appropriately, saving her work to her personal folder on the intranet. Adjacent to her sat a boy who had also entered the room carrying no work materials. He immediately logged onto the intranet, checked his in-box and located the comments and suggestions that his teacher had provided. Having accessed his previous work he now made a number of alterations, building upon the advice received. He saved the revised version to his folder. He then began work on the new task that he had received from his teacher. He too logged on to the internet and copy and pasted various items from a chosen range of web sites. He saved this as a rough draft in his personal folder and e-mailed his teacher to confirm that he had completed the work set.

This school, among a number of others in our samples, uses proprietal software (on the Digital Brain portal) to organise work. This software monitors students' activity, sending an email from the student to the subject teacher, when new work has been submitted into the 'folder' from which the teacher can collect it. Feedback is then emailed back to the student.

2. The boundary between teaching space and personal learning space

Teachers and learners engage with technology in different ways. While teachers see the value of technology they are not necessarily comfortable with the technology. For example, Sandford *et al*. (2006) found a significant majority of teachers (72%) do not play computer games for leisure, which they suggest highlights a generational gap between teacher and student. However, Taylor (2003) and the ESA (2005) suggest that this as more a life-style choice, that is many teachers choose not to play games, while peers in other occupations do. Equally teachers also appear to have a different understanding of personalised learning to the one held by learners. Preliminary data analyses confirm the fractured nature of the understanding of this core educational concept; while both staff and pupils may see personalisation of learning as good practice and a goal to be strived for, pupils often do not recognise staff efforts to deliver on this concept. This perceptual discontinuity can in part be explained by pupils equating personalisation with 'me time' but we also have evidence that some teachers, while accepting the personalisation agenda, are still operating a controlling model of education.

That said many of our teachers equated personalisation with pupil voice and choice. They also linked this to the need for a curriculum that engaged pupils and for many this was not the National Curriculum.

- *The teachers were particularly clear that personalisation was not individualisation – targeting every child's individual needs because this is unrealistic. It's a more rounded approach.*
- *Personalisation was seen as something that good teachers had been actively involved in for decades. The key issues are meeting individual needs and offering differentiated learning programmes. The problem with the rhetoric around Personalising Learning is that it implies that each child should have an individual learning programme and this is not possible in a class of 35 children.*
- *P-learning is a two way process (between student and teacher), not something you can just 'do to kids', they have to be involved in it too.*

3. *The boundary between school space and living space*

Effective home school links through digital technologies are seen as central to the implementation of the personalisation agenda. Indeed Green *et al.* (2005) argue that the challenges posed by the Personalising Learning agenda may prove difficult to meet without digital technologies as there will be a specific requirement for *"the communication, archiving and multimedia affordances of digital resources"* (Green *et al.,* 2005 p. 5).

Schools are being encouraged to reach out into the home and, to a lesser extent, the home is reaching into the school. Many homes are rich in technology. Figure 2 is a visual representations of secondary school pupils' active use of a variety of technologies at home and school. The data are taken from the Personalising Learning Project focus group interviews (Underwood *et al.,* 2008b) and they clearly show the richness of the home as compared to the school digital world. This suggests that linking the school and home digitally is eminently doable. However, not all of homes will have the necessary facilities at an appropriate level, to link to the school.

Figure 2 about here

Frustration is one outcome of the disparity between the quality of home and school connectivity, but heads were also concerned about disenfranchising their pupils. In those cases where it was seen necessary, heads indicated that they were considering a number of solutions to ameliorate this problem. These included opening the school after hours to those who do not have quality access at home; targeting out of school internet skills lessons to those without home access; loaning laptops to pupils and providing laptops for teachers, often through the 'laptops for teachers' scheme. The case study reports suggest that this has been a positive move.

> *In this large, well resourced primary school all staff have been provided with an email address which is also accessible from their homes. The school has placed all formal school documentation online and staff have a communal on-line diary and message board on the web site. Through the web site, schemes of work and lessons plans can be shared by all staff, whether at home or at school. Teachers report that it is easier to use the material in school, however, since few of them have broadband access at home, which is confirmation of the head teachers' perceptions reported earlier. The availability of this resource has resulted in teachers at this school staying later and doing more preparation on site.*

Teachers working in the school rather than at home when possible, is a finding contrary to that of the iSociety (Crabtree & Roberts, 2003) which showed that teachers were downloading through a home broadband link because the school net was too slow, but with our schools the quality of the school provision outstripped many teachers' homes (Underwood, *et al.,* 2005). In contrast the most learners appear to live in a technology rich world.

The digital links between school and home are not universally welcomed and some teachers expressed concern that the private space of the school was being eroded and therefore threatening the development of the learners' independence. Likewise the safety of the home was being threatened as school work can reach into the living room. More concerning to teachers was the threat of bullying going beyond the school gates and also into the home leaving learners with no escape from tormentors.

> *This technologically advanced primary school has an in-house VLE system called Home School Learning (HSL). This is fully accessible from home and contains details of all of the children's classwork as well as homework assignments. This is very popular with majority of parents who track of their child's progress. However, some parents feel that this level of accessibility puts undue pressure on the children to work at home.*

As identified elsewhere (Underwood, Dillon & Twining, 2007) the thorny issue of lack of home internet access for some 20% of pupils remains and is being met largely through after school access time for these pupils.

Technology inversion

The technology is developing from the bottom of the educational system upwards. Pupils at Key Stage 2 are doing tasks as a matter of course that senior academics have no idea about.

> *A year six literacy session involved pupils in parallel classes writing shared reports about the Antarctic on the interactive whiteboard. When each class had prepared their report there was a tick box on their half of the split screen for them to register they were ready to exchange files with the parallel class. They then received, marked and returned the other class's report. The pupils commented that their teachers were beginning to let them use the whiteboards now, since the teachers had become more confident themselves.*

Responses to focus group questions repeatedly found learners with the expectation that they had greater experience and expertise with ICT than their teachers and parents. They describe themselves as being immersed in digital technologies and perceive the adult groups as still sat on the side of the pool building up courage to jump in. In observations of class activities we collected numerous instances of learners as young as year 2 helping the teacher to manage the technology by correcting errors and troubleshooting gliches.

One rural middle school had turned the low level of specialist support into an educational opportunity.

> *Pupils are being used as mentors to less skilled pupils. They have to achieve five competency tests to become a webwizard, after which they are allowed to contribute to the general maintenance of the ICT facilities by, for example, ensuring that laptops are stored appropriately and are left on charge. One year eight child has a special position in this process and appears to fulfil the role of an onsite technician.*

The Savvy Students and Empowered Citizens

The argument that the younger generation must be rescued from the clutches of digital technologies is loudly voiced and while there are worrying examples of abuse and misuse of technology, are pupils really in need of being rescued? For many working in the field there is a growing acceptance that, as Southwell and Doyle (2004) have argued the

answer cannot be a simple yes or no. While there is evidence of the net generation being overly cavalier with personal data, there are *savvy pupils* with a full understanding of the importance of protecting data. This was evident in discussions with a mixed group of year 9 pupils.

> *These pupils had a good understanding of some of the issues relating to Internet use, citing for example, inherent dangers in using social networking sites like Facebook in comparison to using MSN messenger, which they all seemed to use regularly. They were fully aware that such sites were not private and their details could be accessed by unfamiliar adults, which they found threatening. They also recognised the potential for cyber bullying and the possibility of their identity being compromised now and in the future. MSN messenger was a preferred method of contact outside school as it is a direct and exclusive link between you and the person you had invited to chat with you. Whilst there were no gender differences in pupils' overt response to Facebook, both boys and girls were aware of the issues hence chose not to use Facebook; however it was the girls who were most concerned and who felt most vulnerable.*

This awareness raises pupils to the level of discerning consumers rather than naïve victims; this was also apparent in some pupils' attitudes toward their data files. Across the focus groups a number of pupils identified their data stick as a 'must have' tool. Their reasons for this were generally pragmatic; the stick allowed ease of transfer between home and school, so was great for homework, and file sharing between friends.

> *However, one Year 9 pupil pointed out that he favoured the data stick because 'school can't steal it' –' it' in this case being his data. He could bring material to and from school without it being tracked, thus maintaining his privacy and independence. This made the data stick preferable to the VLE, which had echoes of 'big brother' in this young man's eyes.*

4. The boundary between school space and teaching space

Personalising of Learning and the UK National Curriculum

One of the misalignments between the school space and the teaching space concerns the need of the school for measurable outputs in the form of results from high stakes tests such as SATs and GCSEs and the ambition of teachers to personalise learning for their learners. For some schools the National Curriculum is antithetical to the personalising of learning agenda.

- *The National Curriculum needs to be more flexible and engaging in order to achieve p-learning. The national curriculum causes problems with this (individualised learning and differentiation) however – personalisation needs pupils to be engaged and this not always happening with the curriculum as it is presently. Further, the National Curriculum is very prescriptive in its outline and does not always allow teachers to be creative. Needs to be more flexible.*

The allocation of children to classes in schools can create groups who are less focused on SATs and therefore able to work beyond the National Curriculum.

> *The unusual mix of years 4 and 5 in this rural primary school has provided an opportunity to be more bold with the curriculum. In this class the teacher has chosen to design her lessons using the 'Mantle of the Expert'. This is a particular style of teaching where pupils and teacher use drama and role play to learn together. They learn for a reason, undertaking shared research to become 'experts' in their own right. The set up for the class at the time of the visit was a company focused on saving orangutans in Borneo. KORC (Kingabantan Orangutan Rescue Centre) is led by Anna (played by the teacher whenever she takes her beads off) and the children are scientists and volunteers.*

In the previous lesson it had been discovered that KORC was low on money and the company needed to develop some fundraising activities to keep the operation going. Different groups of children were working mainly in pairs to tackle this issue in a wide variety of ways including cooking banana buns which appear to be an essential part of the diet of orangutans and small children.

Inculcating Discerning Consumers

Many pupils, it emerges from our learner data, may be described as digitally savvy. Are these savvy pupils simply street wise, collecting their knowledge from the world beyond the classroom or is there evidence of schools aiding the development of the critical analysis exhibited here? In the descriptive model (Figure1) it was argued that the culture, ethos or vision of a school would be an important predictor of educational outcomes. Is there evidence to support this argument? In the case of the student rejecting the VLE because of its 'big brother' connotations, it seems unlikely that the school has impacted on him in a positive way. The school operates a full digital monitoring programme with lesson-by-lesson registration and rapid feedback to parents. This pupil sought to reduce the school's data collection on his activities and in this sense we might call him street wise. However, there are schools whose vision and practice have a clear focus on the development of not only the discerning consumer but also the discerning citizen.

- *The pupils who so ably articulated their rejection of Facebook are drawn from a school (secondary: socially disadvantaged) whose policy is one of openness, particularly in regard to the Internet and digital technologies in general. In the focus group, teachers at this school expressed the need for pupils to be exposed to both the ills as well as the joys of surfing the net while, they the staff, could provide a positive context in which to debate issues.*
- *In a second school (secondary: socially advantaged) which operated a similar monitoring system, the pupils viewed this surveillance with equanimity and not as an infringement of liberty. However, in this school pupils were allowed considerable freedom in their use of digital tools, as exemplified by the school by-passing the local RBC controls to give pupils exposure to the wider Internet.*
- *A third school (primary: socially advantaged) has extended this sense of openness in that it declares itself as a school without rules. Pupils here choose their own learning pathways and modes of working. The pupils have learnt to take responsibility from a very young age. The school is successful on all objective measures and the children here are empowered and empowering.*

Other schools however, operated a policy of containment where social networking software was concerned. These schools are in the majority here, a finding mirrored in the Harnessing Technology 2008 Survey, which showed that "software was not overly encouraged by teachers in supporting pupils with their learning" (Smith & Rudd, 2008, p.30).

Reflections

The data collected here provide a partial validation of the Personalising of Learning Model. By capturing space, behaviour and opportunity we have been able to describe the ebb and flow of activity between the school and home, and teaching and learning. In particular we have highlighted the boundaries between different digital worlds and shown the potential barriers to effective teaching and learning.

Underwood and Banyard (2008) have reported that managers, teachers and learners understand personalising learning in different ways. Our analyses confirm the fractured nature of different stakeholders' understanding of this core educational concept: while

both staff and pupils may see the personalising of learning as good practice and a goal to be strived for, pupils often do not recognise staff efforts to deliver on this concept. Pupils equating personalisation with 'me time' can in part explain this perceptual discontinuity but we also have evidence that some teachers, while accepting the personalisation agenda, are still operating a controlling model of education. Many teachers, however, equate personalising learning with pupil voice and choice. They also link this to the need for a curriculum that engages pupils and for many teachers this is not the UK National Curriculum. ICT can provide opportunities for developing the personalising agenda but it can also provide the illusion of individual learning while actually restricting innovative work.

The people who predominantly occupy the learning, teaching and institutional spaces have very different experiences and expectations of digital technologies. The digital world is the norm for pupils, even those of a very young age, and this is not always recognised by teachers. It is aspirational and functional, and is an important way of defining and expressing an individual's identity. However, learners engage with digital technologies in ways that are only partially recognised and explored by schools. Schools have very different responses to this digital world. Some schools have policies of containment while others seek to engage with pupils and through these burgeoning technologies.

The digital divide between teachers and pupils remains a reality. It can be argued that this is a transient problem that will disappear as a new, more e-mature generation of teachers takes its place in the classroom. However, new technologies continue to evolve and change rapidly and early adopters and innovators will continue to be over-represented in children and young and under-represented in adults. There are also further digital divides between parents and children and it is clear that children are claiming part of this digital world as their own and using it as a vehicle for personal independence.

As in previous studies there are concerns about home school links that can be encapsulated first under work-life balance (when do the youngest children get to play?) and secondly equity issues. Although, in this sample of schools, pupils in socially disadvantaged areas who, it was anticipated, would be technologically disadvantaged, still had high access to technology. The model presented here draws attention to the overlap of these spaces and challenges schools to respond to these new ways of learning.

There is a need to create greater alignment between curriculum, assessment and pedagogy for the digital school. Wood (2006) has argued that the misalignment of assessment and an ICT rich educational experience requires radically new approaches to assessment. McClusky (2005) argues that many schools do not grasp the importance of ICT for assessment and therefore holistic change. Contrary to this, the e-Mature schools within this sample demonstrated that teachers had a very real awareness of what the technology could deliver but were frustrated by the current curricula and assessments.

Assessment is still largely conducted in the UK using traditional (i.e. pre-digital technologies) techniques, and focuses on traditional (i.e. pre-digital technologies) academic skills. The origin of these techniques in UK education can be traced back through the University of Cambridge Local Examinations Syndicate (UCLES) to 1858 when a group of academics were invited by some Durham schools to develop assessment techniques for their pupils. The schools were observed to capture how the pupils were being taught. Tests were devised to match the teaching and learning that was taking place. The techniques for external examination are largely the same today even though the style of teaching and learning has moved on dramatically. There is a clear need to create assessments that better measure the shifts in learning activities that accompany effective use of digital technology. For example what form of assessment best captures the move from essay to story boarding or the rise in visual as opposed to verbal presentational skill.

In the traditional model of education the design of the learning space was mainly under the control of the institution and the teacher. The physical characteristics of the personal

learning space can still be influenced by teachers and institutions, but the design of that space and the uses of the technology are under the control of the learners. At our university our library information services provides academic search facilities and e-learning support but the students choose to Google. To create effective learning it is necessary to understand the different spaces in the personalising of learning and to respond to the perceptions and behaviours of learners.

Recommendations

1. The various stakeholders (managers, teachers, learners, parents) should develop better understandings of each others' experience and use of digital technologies.

2. Curricula need to be adapted to take account of the digital technologies to allow for the personalising of learning.

3. Assessment of learners needs to be reviewed to better capture the learning, both formal and informal, that is taking place.

4. Policy makes and managers need to respond to the digital divides that exist by age, professional status and economic disadvantage.

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Figures

Figure 1. Model of Personalising of Learning

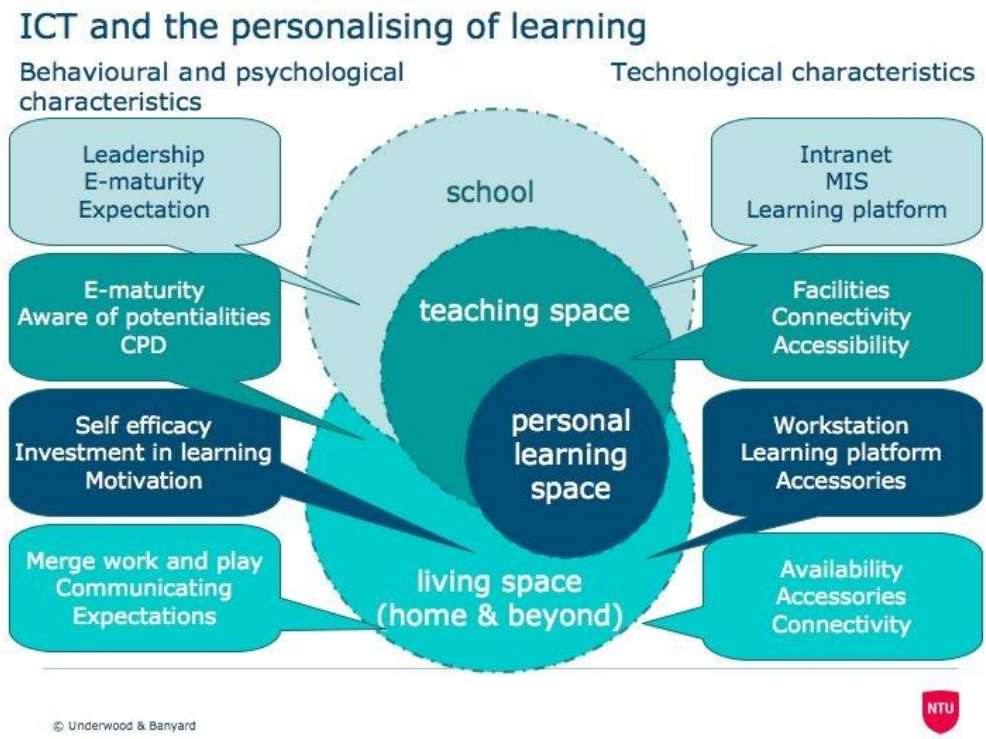
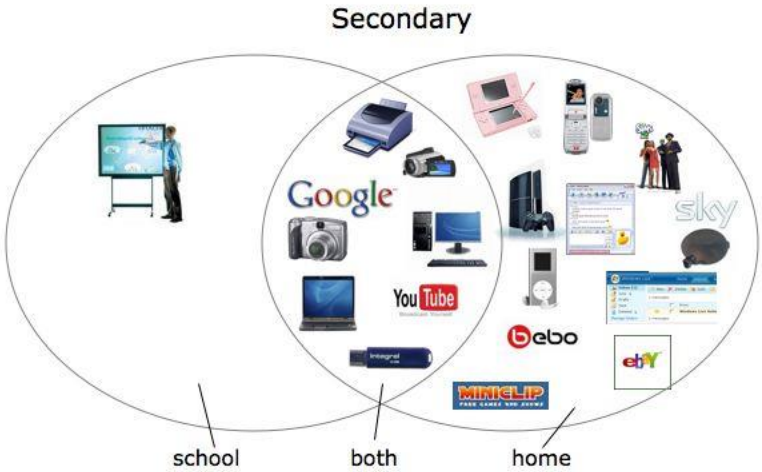


Figure 2. Technology worlds at home and at school



Paper 2

Underwood, J., & Banyard, P. (2006). Learning and technology: A happy conjunction? In K. Steffans, R. Carneiro & J. Underwood (Eds.), *Self-regulated learning and technology enhanced learning environments* (pp. 64-71). Aachen: Shaker Verlag.

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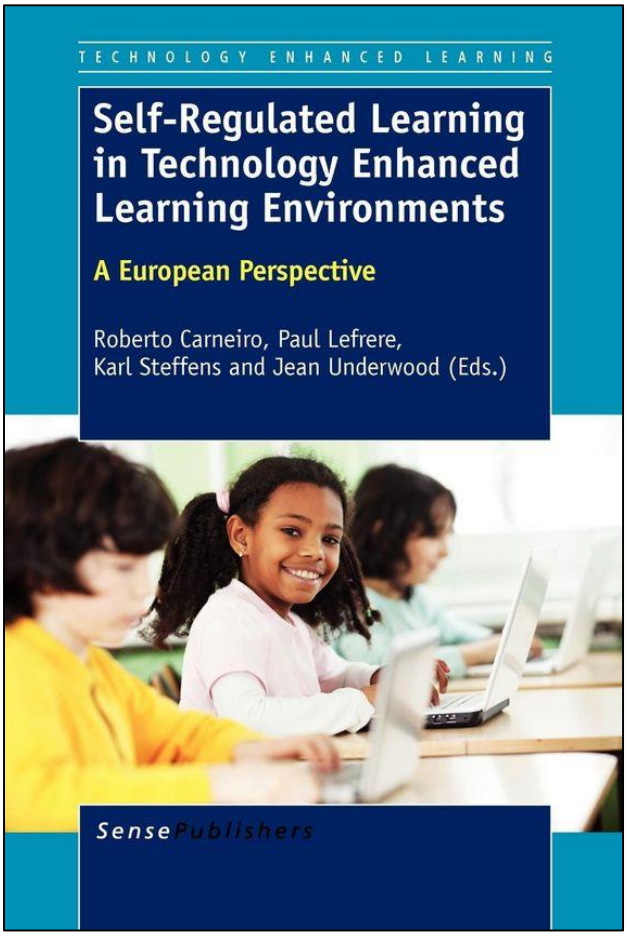

LEARNING AND TECHNOLOGY: A HAPPY CONJUNCTION?

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KEYWORDS

Agency, learners, self-determination, Self-regulated Learning (SRL), skilled performance, Technologically Enhanced Educational Environments (TELEs).

ABSTRACT

The paper considers how Technologically Enhanced Educational Environments (TELEs) can contribute to the development of Self-regulated Learning (SRL). SRL is a sub set of Self-regulated Behaviour (SRB) which is a mechanism for monitoring and restoring well-being. A distinction is made between autonomous and controlled behaviour regulation to reflect the difference between goals set by the learner and those set by the tutor. The role of the tutor in facilitating SRL is discussed. SRL is also affected by the various goals which compete for any student's attention and also by individual differences. The question for TELEs is to identify what added value they bring to the learner with regard to SRL. TELEs have clear advantages in terms of their anywhere, anytime flexibility and in their intrinsically motivating properties. Despite these advantages they do not necessarily promote SRL. Finally, a paradox is posed concerning the ambition of educationalists to promote SRL while the constraints of formal education only allow controlled behaviour regulation rather than autonomous self-regulation.

STARTING POINTS

The starting point for this discussion is the EU funded TELEPEERS project which has investigated the opportunities provided in a range of Technology Enhanced Environments (TELEs) to provide opportunities for Self-regulated Learning (SRL).

While it is recognised that learning is a life-long activity and that much learning takes place outside of formal educational settings, in this discussion we draw our exemplar arguments from formal learning contexts, whether they are face-to-face in the class or lecture room or at a distance. Further, there are two underpinning assumptions of the argument presented here.

The first is that the primary aim of education is to facilitate the development of skilled performance; the development of the cognitive and social abilities of the learner is and should be the paramount goal of education. The use of the term skills here is not confined to low-level procedural competences rather it includes the range of skills to operate effectively within a complex dynamic environment. Such skills include the ability to problem solve and to interact effectively with others.

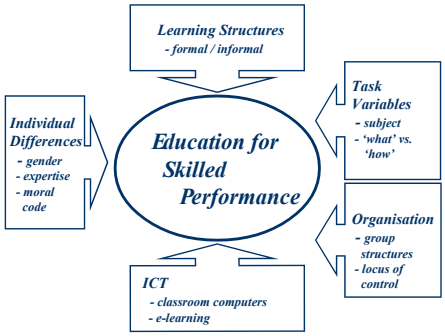

Figure 1: Education For Skilled Performance: Factors Impacting Directly on the Learner (Underwood and Dillon 2004)

A second assumption is that the educational environment is comprised of a complex set of factors and relationships (see Figure 1) that impact on the learner's progress through the educational system, including the prior knowledge and skills the learners brings with them and the organisational structures put in place by the educational institution. There are, of course, a number of additional factors that impact on learning that are not represented in this diagram. Some are directly influential at the learner level, and these include elements of the home and community environments. Then there are factors such as national and local policies, which have a secondary impact in that they influence the behaviour of educators and institutional policies.

From this myriad of factors we will focus on two. At the learner level we are concerned with mechanisms by which the learner controls the learning process that is on the concept of Self-regulated Learning (SRL). At the contextural level the focus will be on the role of TELEs in supporting SRL.

SELF-REGULATED BEHAVIOUR AND SELF-REGULATED LEARNING

The concept of SRL has emerged from the more extensive literature on Self-regulated Behaviour (SRB). Vancouver (2000) defines self-regulation as the processes involved in attaining and maintaining *(i.e. keeping regular)* goals, where goals are internally represented desired states *(i.e. within the self)*. SRB involves: goal establishment including adopting, adapting or rejecting goals; planning that is preparing to pursue a goal; striving - moving toward or maintaining a goal; and finally revision which encompasses the possibility of possible changing or disengaging from a goal (Austin and Vancouver 1996). However, Wood (2005) argues this is too narrow a definition. Although it encapsulates internal processes it does not capture those transactional processes that Karoly (1993) sees as essential in the purposeful pursuit of any goal.

SRB is a mechanism for maintaining and restoring well-being and avoiding negative status in all aspects of life and SRL is a subset of that more general concept. Karoly (1993), defines the self-regulation mechanisms underlying cognitive and somatic based learning as those processes, internal and/or transactional, that enable an individual to guide his or her goal-directed activities over time and across changing contexts. Goal seeking does not necessarily lead to outcomes that society would define as positive or beneficial. While goal attainment and maintenance are seen as central to self-regulation, goal disengagement may prove equally important. Goal disengagement can be beneficial to psychological well-being, particularly if the initial goal is not achievable and if disengagement results in the pursuit of new more attainable goals (Wrosch et al. 2003).

Regulation implies modulation of thought, affect, behaviour, or attention via deliberate or automated use of specific mechanisms and supportive meta-skills. The processes of self-regulation are initiated when routinised activity is impeded (for example the failure of habitual action patterns) or when goal-directedness is otherwise made salient (for example with the appearance of a challenge). Transactional process provide the vital link between internal self-regulatory processes and human action

Self-regulated learners draw on their knowledge and beliefs to devise an interpretation of a given academic task. These learners will set goals and think about the skills and strategies for achieving these goals. They monitor their progress toward the goals by judging their success against these goals (Zimmerman 1989), and they recognise deviations from their expected rate of progress.

SRL highlights academic performance and develops through purposive engagement with the fundamental concepts and structures of the domain knowledge as students strive for academic success. However, while traditional models of SRB assume that the behaviour is determined by individual goals and needs with limited influence from others or the environmental context (Jackson, MacKenzie and Hobfoll, 2000), the extent of the influence of factors outside of the self are very apparent in the learning context, where teachers, institutions and even governments define acceptable learning goals. As Garner et al. (2000) so poetically put it, the classroom is where teachers dragoon learners into doing things they think are good for them. While this is possibly an overstatement, in the formal learning context the learner whether child or vocational trainee rarely sets key learning goals although there maybe choice on the path to such goals. Deci and Ryan (2000) sum this up in their theory of Self-Determination which makes a clear distinction between autonomous and controlled behaviour regulation. In the former goals emanate from the individual and are set because of personal importance. In the latter controlled regulation occurs when the individual feels coerced or pressurised to obtain a goal set by external but also internal forces. Autonomous goals (e.g. desire to master a subject) are more likely to lead to successful outcomes than developed through controlled regulation (e.g. tutor or parental targets to do well).

Of course self-regulation is not always the most strategic approach to academic success. As Garner et al (2000) intimate, students who fulfil the perceived expectation of tutors will receive high marks.

THE IMPORTANCE OF SELF-REGULATION FOR LEARNING

Glaser (1996) asserts that a fundamental principle underlying the acquisition of any level of competence is the change in agency for learning as expertise develops. Initially learning involves often extensive external support on the part of significant others (Vygotsky 1978) such as a teacher, a parent or an expert in the area of skill to be learnt but the need for such support fades with growing competence. This shift in agency is central to concept of scaffolding (Wood et al. 1976) and contingent tutoring (Wood and Wood 1999). The analysis of tutorial contingency is primarily concerned with assessing the impact of social interaction on task learning and is based upon microanalyses of moment-by-moment interaction between learner and tutor (mother, teacher or machine). The concept has arisen out of diadic interaction rather than small group teaching. Effective contingent instruction places heavy demands on tutors - demands that good machine based systems can in part meet, that is TELEs can provide some aspects of contingent instruction. From the Telepeers project the programming environment produced by colleagues in Compiegne, provides such support but in other TELEs such as DIVIDU from the Vrije Universiteit, Amsterdamthe tutoring resides with staff and peers and the TELE supplies the environment within which exchanges take place. These individuals or TELEs play a vital role as contingent tutors in the acquisition of skills and knowledge.

The basic ideas of contingent instruction are *'deceptively simple to state, though hard to achieve in practice*" (Wood and Wood 1999; p.154). When a learner exhibits difficulties the contingent tutor offers help. If the difficulty is not resolved then the tutor offers more extensive, some would say intrusive, help until the learner resolves his or her difficulties. Once the learner shows a degree of competence with the material the tutor fades or withdraws allowing more and more responsibility to pass to the learner. It may appear at first sight that the contingent help is rather didactic and that it is couched in terms of what the tutor does to or for the learner, but Wood and Wood (1999) argue that this is a two-way model, an interaction between tutor and learner and that contingency is an emergent property of that interaction. Not only does the learner's knowledge change through the interaction, the tutor develops an internal model of the learner's progress which is progressively modified by the behaviour of the learner. The development of the learner model allows the tutor to tailor feedback to the

learner. Wood et al (1976) suggest that effective helping involves two ingredients The first concerns circumstances in which a child gets into difficulty. Here the tutor immediately offers more specific instruction or help than was offered previously. The second ingredient of effective instruction is fading, that is providing the child with the minimal help needed to ensure joint success. This requires the tutor to withdraw or fade from the interaction if the learner is being successful.

As experience and competence increases the individual increasingly internalizes control over the learning situation and the honing of performance that is they begin to self-regulate. However, Bielaczyc et al. (1995) argue that the acquisition of cognitive skill is affected not only by the quantity but the quality of self-explanations produced by learners. Learners need relevant strategies which lead them to ask not only do they know and understand but whether that understanding is at a sufficient level.

In summary this chapter is predicated on the assumptions that:

- Self-regulation is a general adaptive process for maintaining and restoring well-being.
- Self-regulated learning is a subset of SR focused on academic success.
- The role of the tutor is to promote academic success by mediating the change in the student from controlled to self-regulated learner.
- TELEs can enhance the role of the tutor in this process and in some cases can replace it.

SELF-REGULATION; A CONCEPT IN FLUX?

There are procedural, epistemic and conceptual divergences in the models of self-regulated learning in education (see Boekarts and Corno 2005). Models may variously emphasise volitional behaviour (Corno 2004), cognitive processes (Winne 1995) or cultural settings (McCaslin and Hickey 2001) but all assume that students who self-regulate their learning

- Engage actively and constructively in a process of meaning generation.
- Adapt thoughts, feelings and actions as needed to affect learning and motivation
- Use standards to direct learning and set goals
- Have individual differences whether inherent or learnt which enhance or interfere with self-regulation
- Mediate the relationship between achievement and individual and contextual characteristics through self-regulation.

Self-regulation guides behaviour along a specific path to a directed aim or goal. In the goal selection phase of SR, determinants of intention (goal commitment) are hypothesised to play a key role. In social cognitive models these include

- risk perception
- outcome expectancies
- social influences
- perceived competency (self-efficacy)

Although these models are good at predicting intention they are poor at predicting actual behaviours, that is they are not necessarily models of behavioural change. Directions of behaviours are influenced by long- and short-term, important and non-important, and easy and difficult goals that are prioritized and strategically implemented according to individual aims during self-regulation. The effectiveness of SRL is dependant upon the clarity and power of the goal setting. Clarity needs little explanation but by power we mean the strength of the goal to stand up to other competing goals which the individual may have outside of the learning context. SRL theory is challenged when the individual has competing goals. A current example from our own teaching will illustrate this balance of long-term and short term goals. The long term goal of completing the final year degree project weighs heavily on one of our students, but not so heavily that she has turned down an offer of a tutorial she badly needs and wants because she is attending a 21st birthday party the night before the tutorial!

COMPETING GOALS

There are then many goals or targets which compete for any student's attention. For example, in the search for personal development, students may strive to achieve:

- Academic success (*look at my certificates*)
- Personal validation (*I'm proud of my achievements*)
- External validation (*my mother will be very proud*)
- Personal discovery (*climb every mountain, or very small hill*)
- Social acceptance (*everybody loves me - I'm successful / I don't work*)

Boekarts and Niemivirta (2000) suggest that there is a tension between academic learning goals and ego-protective goals and that is the balance achieved between these opposing goals which controls the direction the individual will take. Ego-protective goals can be adaptive, for example unrealistic optimism is a requirement for good mental health. People have been found to consistently rate themselves as healthier, wealthier and happier than their peers (after Weinstein 1982). Unrealistic optimism about educational progress and potential can be seen to be adaptive but it is likely to inhibit self regulation because self monitoring of performance has a self-serving bias. However, some individuals, in an attempt to protect their ego from self-criticism, may disregard vital information from observation in a self-serving bias, and thus, limit the effectiveness of self-monitoring (Baumeister et al. 1993; Krosnick and Sedikides, 1990). However, Carver and Scheier (2000) suggest that a resolution to this impasse in the theory is to view the competing goals as being on different levels in a hierarchy of goals. Baumeister and Heatherton (1996) argue not from a competing goal position rather they suggest that self-regulation fails when an individual makes false–assumptions about what they can achieve, how they can achieve it or how important it is to achieve the goal.

Once a specific self-regulation treatment has been learned and adapted for a specific behaviour, it becomes increasingly difficult to change treatment to be congruent with long-term goals. In other words, too much deviation from the original path may lead to never finding the same path again. Thus, clear and defined goal setting is essential in the initial approach to self-regulation. This is Gollwitzer's (1990) Rubicon Model. Just as Coriolanus crossing the Rubicon was a moment of commitment to invade his home city of Rome, Gollwitzer sees the learner standing on one side of the river setting goals and intents but these can not achieved until the individual crosses the river and then an act of goal striving begins. Gollwitzer's work shows that once the commitment is made then individuals find it very difficult, if not impossible to review or revert back to previously espoused goals.

> Once goal setting has been developed, the ability to self-monitor becomes essential because attention to internal and external cues, through greater self-awareness, leads to faster and more appropriate control of intervention strategies. Attention to internal states (thoughts, feeling, sensations) and external states (bodily movement and environment) is a different phenomenon from attentional styles, though there is overlap between the two.

Boekaerts (2005) points out that the deliberate focus on mindful learning in the SRL literature tells us little about the student who does not fit the pattern of the SR Learner. It also fails to shed light on achievement goals and other goals students pursue. In the messy world of classrooms learning creates different goals

INDIVIDUAL DIFFERENCES

There are strong individual differences in the degree to which students engage in SRL activities. Some students appear to use SRL whatever the study program. While others appear never to engage in SRL activities whatever the study programme. Then again there are intermittent users of SRL mechanisms and it is these in particular that we might argue TELEs can support and provide added value to existing educational environments.

For example, individuals differ in their attentional style, the relationship of concentration and focus to the environment (Zaichkowsky 1984). Attentional style is related to the degree of internal and external distraction and the degree of conscious and automatic control an individual possesses for a given task (Hardy et al. 1996). That is, it is the ability of the learner to intervene and separate important mental content from non-important derived from specific stimuli, and to know when to consciously over-ride actions or to allow automatic processes to continue. This process is governed by the skill of the individual to self-monitor effectively.

The question to consider about TELEs is whether they bring something new and effective to the educational environment or is it just new packaging for old techniques? In particular,

- Do TELEs have a particular impact on occasional self-regulators?
- Are the effects measurable?
- Are the benefits real or just perceived (c.f. benefits of PowerPoint decribed below)

THE TECHNOLOGY DIMENSION

Pintrich (2000) has questioned the strength of the focus on the learner when considering the SRL paradigm, arguing that the context within which the learning takes place constrains self-regulation; that is that learning is situated (Lave and Wenger, 19??). New technologies have and are changing the learning environment and TELES provide a range of contexts within which learning takes place. What is the impact of such technological changes? The anticipation of the benefits of new technologies for learning have increased with the proliferation of computers, the rise of the Internet and increasing levels of connectivity. Although the debate about the value of technology in education rages on - see Hokanson and Hooper (2000) for one of the more balanced debates - here we are interested in the way in which new technologies shape the context within which learning takes place. As Innes (1954) says *"new technologies alter the structure of our interests: the things we think about. They alter the character of our symbols and the things we think with. And they alter the nature of community: the arena in which thoughts develop."* (p.20).

A very simple example, the use of PowerPoint multimedia presentations in lectures, will suffice to illustrate how new technologies change the learning context. Across a range of studies (Apperson et al. 2006; Pippert and Moore, 1999; Susskind, 2005) it has been found that lecturers who use PowerPoint presentations instead of older non-digital technologies such as chalkboards or overhead projector slides, are rated as better on a wide range of teaching dimensions by their students. This positive halo effect for technology users was seen to spill over into activities unrelated to the lecture format such as handing back papers on time, providing helpful feedback, and assigning tasks requiring critical or creative thought. The students also held stronger academic self-efficacy beliefs when PowerPoint presentations were employed. Such lectures were perceived as being easier to understand and take notes from. The students believed that they took more notes and perceived those notes as more organized and useful for studying when PowerPoint multimedia presentations accompanied lecture. At this point it should be noted that little or no evidence has been published to show that this positive response to the technology supported lecture has any preferential benefits on learning outcomes. The point here is that students see the learning environment as more beneficial to them when the technology is used.

Recent developments in learning styles and in new technologies show a clear synergy. As learning becomes more individualised, learner-centred, situated, collaborative, ubiquitous, and spans the life-span; new technologies are becoming more personalised, user-centred, mobile, networked, ubiquitous, and durable setting the stage for a successful but challenging technology learning environment. Sharples (2000) states that there are five approaches to using technology in learning and the TELES studied in the Telepeers project are represented in four of the five approaches. They are as follows:

1. Intelligent *tutoring systems* (Underwood and Brown 1997) that have attempted to replace the teacher. These have had limited success limited success, (Telepeers, Programming Tutorials)
2. Simulation and modeling tools that serve as learner's assistants or pedagogical agents embedded in applications that act as mentors providing advice, (Telepeers, Portfolio)
3. Dictionaries, concept maps, learning organizers, planners and other resource aids that help learners to learn or organize knowledge with system tools and resources, (Telepeers, Cognitive Psychology Webpages, Weblogs)
4. Personalised *communication aids* that can present materials depending on user abilities and experience with the system, and
5. Simulated classrooms and labs that engage teachers and learners in an interaction similar to real classrooms. (Telepeers, SWIM)

The advantages of learning with new technologies particularly those supported through the Internet include flexibility of anytime and anywhere learning (Brandon and Hollingshead, 1999), self-paced learning, ability to link resources in many different formats, accommodating different learning styles, and potential for widening access (e.g., work based students). New technologies are also motivating (Cavendish et al. 1997). Pintrich and Schunk (1996) outline three general types of motivational beliefs; self-efficacy beliefs (that is judgments of one's capabilities to do the academic task); task value beliefs (that is, beliefs about the importance of, interest in, and

value of the task); and goal orientations (that is, whether the focus is on mastery and learning of the task, grades or extrinsic reasons for doing the task, or relative ability in relation to social comparisons with other students). They have shown self-efficacy is positively related to self-regulated self-regulatory strategies such as planning, monitoring, and regulating which have been shown to lead to academic success

Not all is rosy in the technologically enhanced learning environment. For example, staff feel it might be difficult to authenticate learners' work (Underwood 2001) while students may experience a lack of social interaction with peers, learners may feel isolated at not being part of a more traditional community (Motiwalla and Tello, 2000). However the success of TELE learning depends largely on learners' satisfaction with the TELE as this will impact on the learner's intention to continue using it. Eccles, Adler, Futterman, Goff, Kaczala et al. (1983) argue that satisfaction results from the degree to which the TELE is able to fulfill needs, facilitate reaching goals, or affirmpersonal values as this will determine the value of the TELE to the individual.

So one of the most desired characteristics of a TELE is the degree to which it adaptive and personalized, since it has to be used by a wide variety of students with different skills and learning styles. E-learning and the new mobile or m-learning offer increased opportunities to the learner to personalise and to self-regulate. Learners may be satisfied with the technology based learning even when negative aspects of it exist, provided that doing well when using the system is important to them, for example taking a Web-based learning courses relates to their current and future career goals, and it is interesting, enjoyable and fun.

FINAL THOUGHTS

A paradox exists in the debate concerning SRL. While many theorists and indeed practitioners espouse the value of self-regulation, both in learning and as life-skill in general, the formal education system sets the learning goals, requires students to meet those goals and indeed rewards those that do. It can be argued that in formal education at least then the we can only promote controlled behaviour regulation (Deci and Ryan 2000) and not autonomous self-regulation as the latter requires individual choice of goals. We would argue here, however, that TELEs can not only provide the choice paths within a controlled behaviour regulation model. They are also capable of subversion or novel use by students and in this way they move us a little nearer to the autonomous self-regulating learner.

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Paper 3

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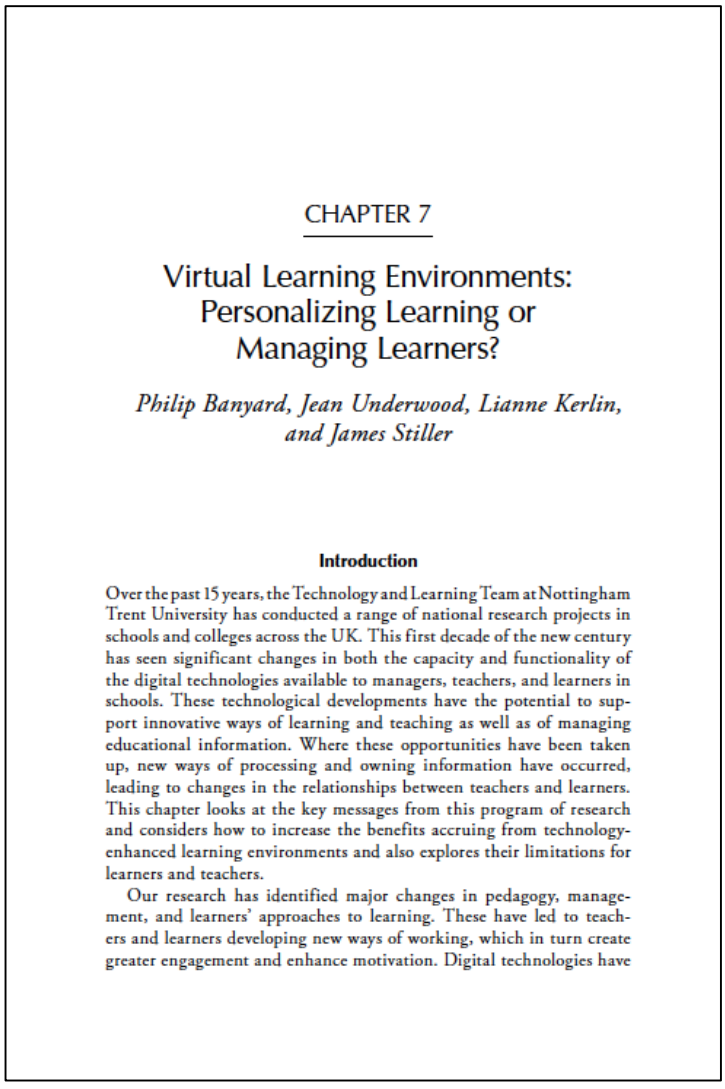

CHAPTER 7

Virtual Learning Environments: Personalizing Learning or Managing Learners?

Philip Banyard, Jean Underwood, Lianne Kerlin, and James Stiller

Introduction

Over the past 15 years, the Technology and Learning Team at Nottingham Trent University has conducted a range of national research projects in schools and colleges across the UK. This first decade of the new century has seen significant changes in both the capacity and functionality of the digital technologies available to managers, teachers, and learners in schools. These technological developments have the potential to support innovative ways of learning and teaching as well as of managing educational information. Where these opportunities have been taken up, new ways of processing and owning information have occurred, leading to changes in the relationships between teachers and learners. This chapter looks at the key messages from this program of research and considers how to increase the benefits accruing from technology-enhanced learning environments and also explores their limitations for learners and teachers.

Our research has identified major changes in pedagogy, management, and learners' approaches to learning. These have led to teachers and learners developing new ways of working, which in turn create greater engagement and enhance motivation. Digital technologies have

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[A] Introduction

Over the past 15 years, the Technology and Learning Team at Nottingham Trent University have conducted a range of national research projects in schools and colleges across the UK. This first decade of the new century has seen significant changes in both the capacity and functionality of the digital technologies available to managers, teachers and learners in schools. These technological developments have the potential to support innovative ways of learning and teaching as well as of managing educational information. Where these opportunities have been taken up, new ways of processing and owning information have occurred, leading to changes in the relationships between teachers and learners. This chapter looks at the key messages from this programme of research and considers how to increase the benefits accruing from technology enhanced learning environments and also explores the limitations of them for learners and teachers.

Our research has identified major changes in pedagogy, management and learners' approaches to learning. These have led to teachers and learners developing new ways of working which in turn create greater engagement and enhance motivation. Digital technologies have facilitated the tracking of the performance of individual learners and given teachers more information from which to develop individual learning programmes. In UK schools, teachers now routinely have online access to student attendance, conduct and achievement (Smith, Rudd & Coghlan 2008). Some schools have pioneered and promoted new techniques for achieving this, for example a secondary school in the east of England has cooperated with a software company to produce a system for monitoring conduct of learners across the school (Underwood et al., 2009a). The *ibehave* (ISIS Software, 2010) system allows teachers to record and access the incidents of good and bad behaviour by the learners and the system also generates automatic feedback to parents about their children at the school. The *ibehave* system has been marketed to local schools and the income from these sales is helping to fund other IT initiatives in the school. This facility and similar systems are transforming the management of information in schools and offer the potential to transform the relationship between teacher and learner (Underwood et al., 2009a).

The key question to consider concerns the impact of individual technologies on teaching and learning and how this technology can be used to greatest effect. Sometimes a technological innovation appears to be an excellent idea but fails to deliver, and sometimes a major impact can come from an apparently minor technological innovation. Wikis appeal to teachers and lecturers as an ideal medium to create class projects but despite their apparent usefulness the facility has not been effective at the learner level as it is not commonly used by the student body. This is mirrored in the development and use of the microblogging site Twitter. This facility also appeals to managers and teachers but the demographic of Twitter users is skewed away from young people. The most recent data from the USA (Quantcast, 2010) shows that nearly 90% of twitter users are aged 18 years or above. It also shows a steady decline in Twitter posts over the last six months.

[A]The political context

[B]The technology rhetoric

The work carried out by the research team and discussed in this chapter is set in the context of major UK government investment in educational technology. This investment comes with an expectation, and maybe a demand, that the technology will bring measurable improvements in educational performance. Each new major initiative, such as the roll out of broadband connectivity in the early part of the decade, was seen as providing the 'silver bullet', namely, that it will stimulate major improvements in performance. In a keynote speech the UK Secretary of State for Education and Skills at the time underlined this emphasis, arguing that the government saw "ICT and its potential to transform how we teach, learn and communicate as crucial to our drive to raise standards" (Kelly, 2005, p. 4.)

On the basis of these presumptions about the value of ICT in UK schools, substantial investment was made in the infrastructure of educational technology. The mean ratio of pupils to computers dropped dramatically in the period from 1998 to 2004 from 17.6:1 to 7.6:1 in primary and 8.7:1 to 4.9:1 in secondary schools. Interactive whiteboards became ubiquitous in UK primary schools and the majority of secondary schools were providing all of their pupils with an email account (Prior & Hall, 2005).

Technology targets are having significant impacts on schools (Smith, Rudd & Coghlan 2008). For example, there has been an active policy to encourage the embedding of VLEs in UK schools; a policy outlined in the UK Government's 2005 strategy paper 'Harnessing technology – transforming learning and children's services'. Our understanding of what constitutes a learning environment has evolved from small scale highly specific educational packages though large scale multifunctional Virtual Learning Environments (VLE), to Personalised Learning Environments (PLE). The latter adds individual configurability to peer-to-peer learning, community of practices (CoP) and the VLE. It would be fair to say that mainstream UK schools are currently at the VLE stage of development integrating their management systems with content delivery and a hint of learner personalisation (Ofsted, 2009b). The VLE is the common term used in the UK to describe the organisation of data in schools and the interface between the learner and the school. Elsewhere it is referred to differently, for example a Content Management System (CMS).

[B]The move to personalisation

Alongside the belief in the efficacy of technology in education there has been a drive towards personalising learning, which also come with a political rhetoric. In 2005 the then UK government asserted: "Personalisation is the key to tackling the persistent achievement gaps between different social and ethnic groups. It means a tailored education for every child and young person, that gives them strength in the basics, stretches their aspirations, and builds their life chances. It will create opportunity for every child, regardless of their background" (HM Government, 2005 p. 2).

Personalised learning is understood in different ways by managers, teachers and learners (Banyard & Underwood, 2008). Our analyses confirm the fractured nature of different stakeholders' understanding of this core educational concept: while both staff and pupils may see the personalising of learning as good practice and a goal to be strived for, pupils often do not recognise staff efforts to deliver on this concept. This perceptual discontinuity can in part be explained by pupils equating personalisation with 'me time' but we also have evidence that some teachers, while accepting the personalisation agenda, are still operating a controlling model of education. There are those teachers, however, who equate personalising learning

with pupil voice and choice. They also link this to the need for a curriculum that engages pupils, and for many teachers this is not a national curriculum with set activities and limiting goals (Underwood et al., 2009a; Underwood et al., 2010).

The vision presented by the UK government is one of radical change, not just a matter of readjustments to curricula or pedagogic practice, important though these maybe, but a shift in the social dynamics and practices of all partners including learners so that the individual needs of each child can be met (see Pollard & James, 2004). This would appear to match the potentialities provided by technology enhanced learning environments. Indeed Green et al. (2005) argue that the Gilbert Review vision of Teaching and Learning in 2020 (Gilbert et al., 2006) and the challenges posed by the Personalising Learning agenda may prove difficult to meet without digital technologies as there will be a specific requirement for "the communication, archiving and multimedia affordances of digital resources" (Green et al., 2005 p. 5).

The need to identify and evaluate the role of digital technologies in supporting a more personalised learning experience is stimulated both by concerns about the performance of the current educational system but also an awareness that many learners today are already creating their personalised learning environments outside school using digital resources. For most young people, technology is part of their daily lives. Those young people with access to digital technologies are already using such resources to tailor their informal learning to their own interests (Underwood et al., 2009a; Underwood et al., 2010).

The caveat we would inject into this account of personalised learning concerns the way that the term is defined and operationalised in education. The issue is not about how learners organise their learning focused as it is on the end results of that learning. One view of a personalised education would see learners as defining at least some of their own goals. For example Charles Leadbeater writes: "The foundation of a personalised education system would be to encourage children, from an early age and across all backgrounds, to become more involved in making decisions about what they would like to learn and how" (Leadbeater, 2004, p. 16). This is not the view that is pursued in UK schools where the goals of learning are clearly defined in the context of the National Curriculum and the related performance in national academic tests. It is the route to this performance that is seen as the opportunity for personalising learning, but not the goals themselves.

[A]What has been the impact of the VLE?

From our own and others surveys the impact of VLEs at school level has been mixed (Becta, 2004; Becta, 2007; Ofsted, 2009a; Underwood et al., 2010). Good stories abound, like that of secondary school learner Nathan (described on Becta's website), who really appreciated the efficiency gains of being able to upload and download work without the bother of carrying things between home and school (Becta, 2009). These small changes in the working practice of students on the surface appear trivial but to the user are life-enhancing if not life-changing. Another example is reported by Clarke and Abbott (2008) who present evidence of reflective practice of trainee teachers being supported through the functionality of the VLE. At this level, a VLE can have a dramatic impact on learners and teachers to the point that the change is taken for granted within a short space of time. On the other hand there are numerous stories of abortive attempts to install a working VLE which illustrate the frustration of embedding large scale technology innovations into an institution (Underwood et al., 2010)

Despite financial support many schools are still in the first throws of implementing this key

government policy. The UK government's quality assurance agency's (Ofsted) 2007/8 survey of a sample of educational institutions found that schools were mostly falling behind the national timescales for installing a VLE. Even the minority of schools that had achieved a working VLE were at the stage of thinking through how it might improve learning. With newer ways of working with the technology emerging, principally provided by the potentialities of Web 2.0, (Ofsted, 2009a, p. 34-35) has questioned whether this technology may become redundant even before it is fully embedded.

Web 2.0 or "Web 2" is a fashionable expression that describes a new generation of websites. The term itself implies that the early internet should be thought of as "Web 1.0" - a first edition, or first version. It is argued that this initial version of the web was primarily for static information: material to be downloaded or delivered to the internet user. Web 2.0 is different, it is a more participatory, dynamic and social place. It is more about uploading, especially uploading for communication and collaboration (Sharples, 2010). This rapid change in technology and the way it is used develop s faster than policy can deal with and makes it difficult for education authorities to plan with any confidence for future resource expenditure.

The report from Ofsted is an example of the widespread concern that technology is unable to meet people's expectations. The report states: "The vast majority of the schools visited had yet to identify how they would use the VLE that the government expects them to have in action in the next few years. At the time of their visit, only one primary school in the sample had a functioning virtual learning environment" (Ofsted, 2009a, p. 14).

Some schools, as exemplified by the following secondary school, have resisted the call to implement their VLE policy because of this perceived bias towards teachers rather than students:

> One of our case study reports records: The school does not have a VLE at the moment because the ones that were piloted still seem teacher driven and not focussed on student learning. They do not include social networking opportunities, and Web 2.0 technologies. VLE's tend to be rather static and should be focussed on student engagement and learning. (Interview with Secondary School teacher: Underwood et al., 2010.)

The focus on the individual, including their personal characteristics, and on personal choice has been shown to increase learner motivation and may in turn lead to improved performance (Chou & Wang, 2000; Larkin-Hein & Budney, 2001; Chen & Liu, 2008). However, there are schools that have successfully embedded the technology into their practice as is articulated by this primary headteacher from our own, as yet unpublished, work:

> The VLE has been a major influence in developing the personalisation agenda. Teachers can tailor materials for small groups of pupils. The parents are involved therefore there is a holistic approach to learning, and it helps parents to understand where the pupils are. The teachers planning and assessment has always been good, but the VLE has focused the mind and sharpened the offerings. (Interview with Primary School headteacher, ongoing research project).

There will be individual differences in responses to all technologies. Ofsted report that: "We found no direct correlation between computer expertise and VLE development; rather it was

the more skilled and confident teachers and tutors who treated the VLE as an extension of their normal work. A manager at one college with a well-used VLE said: A VLE is just another tool in a good teacher's repertoire; it is not an end in itself" (Ofsted, 2009b, p. 12).

The VLE appears self-evidently to be a good idea but does it deliver as much as it promises and what are the key benefits and barriers to success? One perceived benefit is the possibility of predicting student performance from the large body of log file and other data concerning student activity through the application of data mining methods to discover hidden patterns, associations, and anomalies (Superby, Vandamme & Meskens, 2006; Nagi & Suesawaluk, 2008). However, perceived disadvantages often relate to the entry level skills required to take advantage of the system (Underwood et al., 2010). Our research over the last ten years (Underwood et al., 2004, Underwood et al., 2006, Underwoood et al., 2010) has witnessed the initial stuttering introduction of VLEs before the current mass roll-out and we are well-placed to comment on how schools have worked with this technology to create workable and bespoke systems for their particular needs.

One school that highlights the potential of the VLE as well as the incipient problems surrounding the technology is a secondary school in a UK provincial town. This school has been very proactive in developing bespoke technology and currently gains significant income from licensing its software to other schools. The school had two false starts with VLEs from which it was unable to gain much benefit despite substantial technical expertise and support within the school. Finally, like many other schools with embedded technical support, it has migrated to building its own Moodle. Interestingly the teaching staff do not have a clear understanding of the Moodle platform but this lack of understanding does not inhibit their use of the system. To the average user Moodle is perceived as an extension of the web and for many teachers at this school the terms Moodle and website are synonymous.

The VLE is currently used mainly as a repository for information although there are plans to extend usage and exploit more of the functionality of the system. Will this happen? Such innovative use usually starts with the more technologically savvy individuals but in this school the innovation leaders are already looking elsewhere for increased functionality. These staff see that greater benefits are to be had by using facilities outside the VLE such as blogs, social networking sites (e.g., Ning), course developments software (e.g., Hot Potatoes) and other Web 2.0 tools. It was suggested that the VLE was frustrating for the IT literate. This frustration is mirrored by many IT literate students who prefer Google to a library interface when searching for learning resources.

The VLE is perhaps not the most effective way of creating a PLE for learners. The rise of social software (McLoughline & Lee, 2007) means that learners are able to personalise their learning outside of the structures of their schools and colleges. The technology affordances offered by Web 2.0 digital technologies have been grasped by many learners as well as some teachers (Holah & Davies, 2009), as they find new ways to excite and encourage their students.

While the school network provides a valuable data resource for teachers and managers, the utility of these data is enhanced though the activities of a dedicated data manager. Teachers are confident with this aspect of the network and appreciative of the gains it provides. The usefulness of network facilities as an aid to pedagogy is less developed which is a common observation in schools. Could it be that the VLE provides a basic resource for teachers for them to build their teaching on? This can work well for teachers who can use it as foundation

for their teaching, but the perceived value of the VLE is such that many teachers and managers see it as a sufficient teaching resource rather than a starting point.

[B]Joint Assessment System software (JAS)

One particular innovation in this school came from an identified deficit in the reports it was producing for pupils. The school framed the task as being to address 'now and next' – identifying what level the student is at now and what they need to do next to move on. The ICT and systems manager was asked to develop an on-line self-assessment facility. The self-assessment software is now marketed as joint assessment (ISIS Software, 2010) and licensed to other schools. The pupils are reported to like the system because of the instant feedback coupled with details on what they need to do next. They are currently creating subject packs, for example in maths, and hope to use the system as a means of getting ICT across the whole curriculum. There are currently 300 schools that have purchased a license for this facility.

JAS gives pupils access to a list of competency statements set at a number of levels that they can review and endorse. When they have reviewed their performance the system generates a report summarising where they are now what they need to do next. On one level it resembles an individual maturity model and the same system could be used to deliver an institutional e-maturity model. The pupil's review can be viewed by the teacher, who is able to amend any response they do not agree with. JAS has a number of other facilities including simple quizzes and tests that again can be reviewed by the teacher at an individual and class level. All of these activities are appreciated within the school because they support current pedagogic practice. One might say they are just innovative enough although, as we now go on to show, an element of the teaching profession does want more than efficiency from VLE usage.

[A]Teacher perceptions of the VLE

In our interviews and focus groups with school managers and teachers (Underwood et al., 2004; Underwood et al., 2005; Underwood & Banyard, 2006; Underwood & Banyard, 2008) we have recorded a marked and consistent ambivalence to the VLE. This ambivalence is not the case of a luddite profession unwilling to respond to new technology as teacher assessments of the VLE concept were largely positive. Teachers recognised the potential of the VLE to contribute to their professional practice and (when successfully embedded into the curriculum) to greatly enrich learning. This is not achieved, however, when the chosen system is not compatible with the school and teaching practices in place.

In those focus groups and interviews teachers outlined the key characteristics of a functional VLE. They identified key features in the way the VLE needs to be set up, the way that learners experience it and also the way that teachers are able to use it. In the first place it is clear that when the VLE is introduced it needs to be effective and supported. Although this would seem an obvious point it is one that is difficult to enact because it requires the early identification of a fit-for-purpose system. Many schools have reported trialling VLEs that failed to offer the attributes of a VLE identified here. Negative experiences of VLEs resulted in a level of disillusionment and recovery of goodwill often proved difficult. Early identification of a usable platform maintained enthusiasm among staff and pupils. It is also necessary to have good support from the Local Authority (LA). The majority of schools with fully functioning VLEs had knowledgeable LA support in the choice and implementation of their VLE policy. However, not all LAs had effectively operationalised their VLE policy. Initial delays in selecting a system, often followed by decisions to change, meant that schools were unsure as to whether to wait for the LA's decision or independently determine a suitable

system to invest in. While educational independence can be a boon, the cost in time, money and goodwill of such aborted implementations is a concern. A further issue concerns maintenance and whether it is carried out by a technician in the school, ICT co-ordinator, the head teacher, the LA or by the company providing the portal. A reliable and maintained system is essential to maintaining effective learning and positive attitudes toward the VLE. Finally, there is the issue of remote access. If the system is being used to provide and store work, it needs to be accessible at home. This also provides the opportunity for families to become involved in the child's learning.

A number of surveys have found that staff value the VLE for its covert rather than overt impact on learning, namely, they appreciated the administrative functions that allowed them to track learner progress and so make informed judgments of how to support those students (Ellis, 2001; European Schoolnet, 2003).

When we consider the way that learners experience their VLE, then the system needs to be easy-to-negotiate, reliable and intuitive. It was clear that VLEs deemed user-friendly and which provided the support demanded of it had a higher rates of use within the schools. They also need to be interactive so that teachers and learners are able to upload, mark and provide feedback to work online. Other necessary facilities include forums which permit the student voice to be heard, opinions expressed and boundaries between years permeated, email and social networking. It is also important that the VLE is pupil-centred and it was a common complaint of rejected VLEs that they were teacher-oriented. Although such VLEs facilitate planning and delivering lessons, teachers felt that such tools were in conflict with the personalising learning agenda. It was argued that there should be the opportunity for learners to set their own targets and workloads and use the VLE to organise their learning effectively.

So for many, but not all, teachers it is important that the VLE works with and not against current pedagogic practice and that that chosen VLE supports the working practices within the school. It is also clear that VLEs cannot be introduced quickly and we identified a need for a three or four year programme of implementation. This needs to be accompanied by appropriate and extensive staff training, and alongside the training the schools have to offer time to develop VLE materials. One head teacher was building time into the staff schedules to update and maintain their areas on the VLE, without this, workloads may be increased greatly.

This long, and not exclusive, list of requirements raises issues about the ambition of introducing VLE as the key driver of educational change. Are we asking too much of this technology and have we fully framed our expectations of this facility?

[A]The gap between potential and use

As part of our most recent project (Underwood et al., 2009b) we explored the gap between the perceived potential of technology and its actual use. We drew on our past research (Becta, 2004; Underwood et al., 2004; Underwood et al., 2005; Underwood et al., 2009a; Underwood et al., 2010,) and used interviews with teachers to devise an instrument to capture this gap. We identified three main fields of use for the VLE; curriculum development, communication and administration, and further identified some key functions under each of these headings. The list of key functions was the stimulus for discussion with teachers, who were asked to identify the potential uses of a VLE with the help of the list but with the clear understanding they could add further functions should they wish to. Once they had identified the potential uses that their school's VLE was able to support, they were asked to provide a statement of

which of these functions they actually used. This research is on-going but in this chapter we include the contrasting responses of two technology savvy teachers. Teacher 1 is a senior manager with responsibility for ICT in the school (Figure 1: Teacher 1) while teacher 2 is head of a subject department but also has responsibility for e-learning in the school (Figure 1: Teacher 2). We make no claim that these are representative of teachers in general but the similarities in their understanding of the functions of an VLE compared to the disparity in their actual use of the system is illuminating.

[Insert Figure 1 about here]

Teacher 2 identified 20 potential functions of the VLE, four more than teacher 1. There was a core of 13 functions which both teachers recognised; external communication and curriculum development were not seen as key functions of the VLE by either teacher. The use of the VLE to host job specifications was an interesting additional function raised by teacher 2. On the curriculum side, teacher 1 saw hosting individual learning plans (ILPs) as a noteworthy function.

Both teachers used a reduced set of the known functions in their own practice. However teacher 1 reported using 12 of the 16 functions identified. These occurred across the three identified areas of administration, curriculum development and external communication. Use of the VLE to support assessment is possibly the most surprising admission from this activity. Teacher 2, on the other hand, identified using a much-reduced subset of only 7 out of 20 functions, the majority of which had administrative or communicative roles rather than tools to support pedagogic practice. This lack of focus on the learner is in sharp contrast to the interviews we conducted under Impact 2008 (Underwood et al., 2010). When we asked schools who rejected a specific VLE why they had taken that decision, the most common reason was that they were teacher-oriented. Although such VLEs facilitate planning and delivering lessons, teachers felt that they were in conflict with the personalising learning agenda. It was argued that there should be an opportunity for learners to set their own targets and workloads and use the VLE to organise their learning effectively

We alluded to ease of use earlier in this paper. Research on the student use of the Internet, in particular, search engines provide some insight into the failure to fully engage with the VLE. Brophy and Bawden (2005) found that students were more likely to use Google than their library's customised database even though the latter provided better quality, that is more targeted, searches. However, Google was more accessible and less opaque and, even though it gave poorer quality outputs, it was the preferred tool for students. As in many other areas of their lives these students are operating under the satificer principle (Simon, 1983).

Software developers should be concerned that so little of what they are offering is being adopted by target users. School managers should be questioning whether they have bought an over specified system with all the ensuing costs that implies, or whether they need to increase the quality and quantity of training of staff in order to get the best out of such an expensive purchase. We would suggest the latter is the case. In schools where some form of VLE has become embedded in practice, it is not unknown to find two VLEs being used, each supporting essential but different activities within the school.

[A]The impact of personalised learning

In our Impact 2008 project we surveyed over 330 teachers. We achieved this through personal contact with selected schools and collected the data via an internet questionnaire. This

questionnaire covered issues of personalised learning, the impact of technology on teaching as well as questions about the use of ICT. Of interest to our argument about the VLE was the open response question that invited our teachers to name their most important pieces of technology. Over half identified their Interactive Whiteboard as their 'must have' technology and a further quarter chose their laptop. There were mentions for Google, YouTube and datasticks but very few for the VLE. This may be an artefact of the question and teachers' perception of what constitutes technology or it may show that teachers are not enthused by this facility. A further question about online resource received more endorsements for the VLE but even for this question the endorsements were minimal.

Stiles (2007), we suggest, would view these findings as unsurprising as he questions whether the VLE can remain the core of any institutions e-learning strategy. He has argued that although many institutions have built their ICT strategy round the concept of the VLE, the technology has proved to be incapable of delivering the flexibility required for the lifelong learner to become reality? This is because the functionality of the VLE is more supportive a transmission mode of education rather than a more tailored, flexible and personalised experience required for lifelong learners. Stiles's argument, based on tertiary distance education, can be extended to mainstream education and it would appear the students in our studies concur with his analysis.

[A]If not the VLE then what?

Phipps, Cormier and Stiles (2008) argue that while the VLE has an important role in the student experience making it a safe and sensible option from the perspective of the institution it is a solution to an old problem which may have lost its relevance in a world of continuous change that requires a continual re-skilling of the population. In particular they question the appropriateness of the VLE as a tool to encapsulate the full sum of a student's educational experiences. With this they are highlighting the need for enhanced e-portfolios which may be held across a range of tools and platforms.

In addition our own work has shown that learners can be ambivalent towards the VLE. In focus groups with primary and secondary pupils (Underwood et al., 2009a) we explored their technology use and their attitudes towards it. One group of year 9 learners (age 13 years) identified their favourite technologies as iPod, laptop, phone, Sky, msn and, most surprising, data-stick. The pupil who chose the data stick explained his choice as being because the 'school can't steal it'. By this he meant that he could bring material to and from school without it being tracked and this made the data stick preferable to the VLE because of the privacy it provided. In a truly personal learning environment, then, some parts of it will be private but a VLE will not offer this facility.

The VLE is able to provide access to a range of learning resources and also to information about courses and assessments (see Weller (2010) and Sclater (2010), for a more in depth discussion of these points). It is also able to facilitate interaction between users but this facility does not appear to be well developed or used. Learners and teachers prefer to use facilities outside of the VLE and outside of the school. It is argued that the VLE is not able to create a truly personal learning environment (Holah & Davies, 2009). The VLE does not reflect how learners interact with new technologies and restricts their learning journey. It is also in danger of deskilling teachers by providing routine and limiting structure within which to teach. The question, as identified by Holah and Davies, is whether one size fits all? As the VLE effectively defines a limited path through the new digital technologies and does not

empower learners to facilitate their own learning using the new technologies, it would suggest that the system can only be an "everyman" technology at a very basic level.

This gap between the learning and formal educational technology is also noted in the Harnessing Technology Report (Becta, 2008): "Levels of access to and use of technology are high among young learners – especially out of school. However, their experience of technology in formal education generally differs from that at home and there are increasing indications that learners' expectations of technology, and, as a result, of learning, are not being met. Learners commonly report that they enjoy learning with technology, and increasingly use a range of tools and approaches to support their learning, including the use of Web 2.0 technologies, which may not be recognised and supported in formal settings." (p. 23).

The answer proposed and enacted by Holah and Davies is to use the range of opportunities provided by Web 2.0 digital applications. The many interactive sites and facilities that can be found in cyberspace allow learners to share, create and broadcast. An example of the power of this approach is a facility created by Holah and Davies for teachers of psychology. Psychexchange (www.psychexchange.co.uk) allows teachers to upload and comment on teaching resources, ideas and videos. Since it was created in 2008 it has created a large and active community of psychology teachers. It has over 21,700 users of which 5,000 have been active in the last month (accessed May 2010). There are 3,700 files uploaded and these have been downloaded over 800,000 times. A community of practice in the Wengerian (1998) sense, that is a group of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly, has been created within a short time that allows teachers to share resources and good practice.

[A]Conclusions

The emergence of new digital services and tools on the web, developments in interoperability, and changing demands pose significant issues but also opportunities for the educational system as a whole. The ambitions for the PLE are immense and the expectation is high. This latter is based on the notion that teaching and learning are relatively well understood and can be enhanced by the addition of a single innovation. This single innovation is tasked with creating personalised and engaging learning environments for learners, for encouraging interaction between learners, for providing an anyplace, anywhere, anytime resource and for providing tracking information for teachers and school managers.

We ask whether this ambition is achievable. Is it possible to produce a 'one size fits all' facility that provides a personalised experience for learners? And is it possible to create a top down system that learners can take ownership of?

Our research shows the benefits of the PLE for schools and for learners. We have found numerous examples of how individual teachers have gained great benefit from the school wide systems. But we have found little evidence of general principles that can be applied to all, or even most schools. We argue that we have evidence for the benefits of personalised learning and also for the use of PLEs, but we observe that there is a need for a clearer focus on what each of these educational projects is aiming to achieve.

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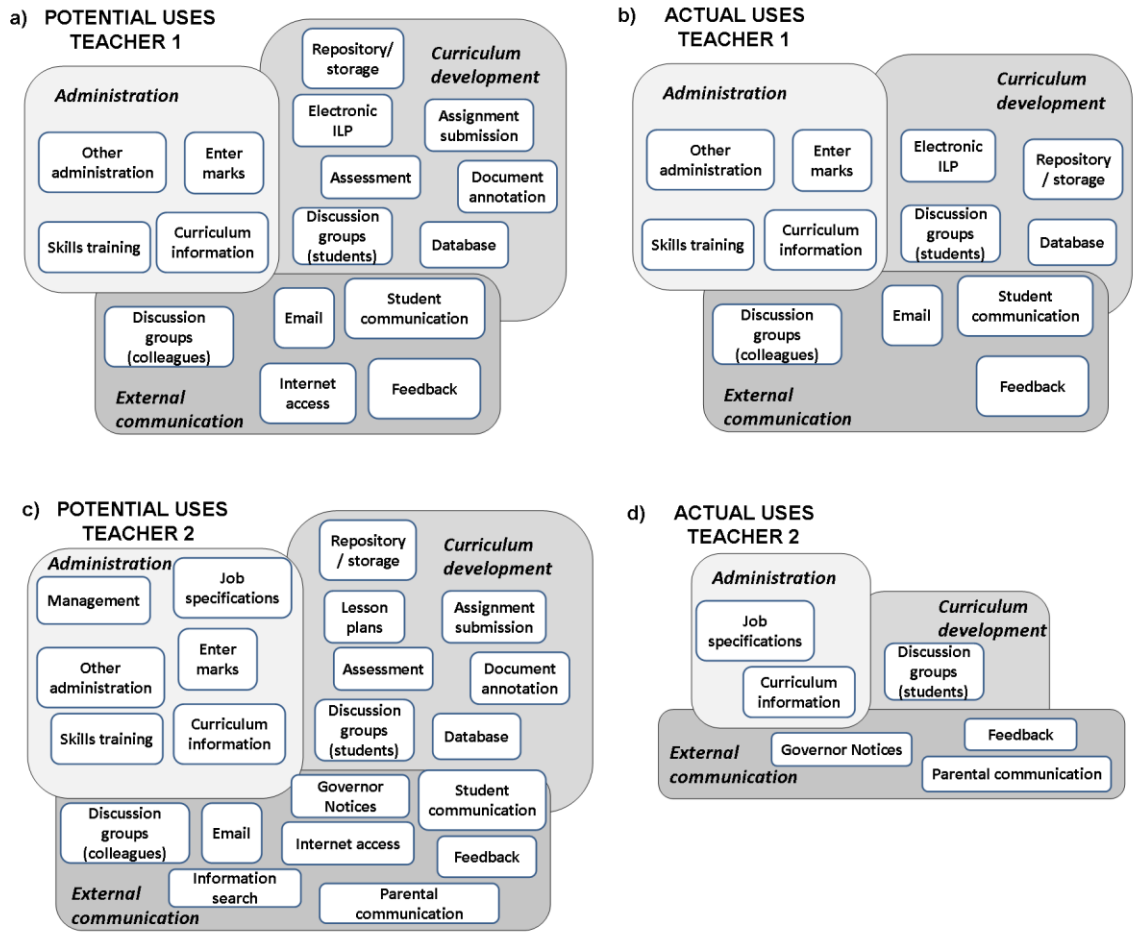
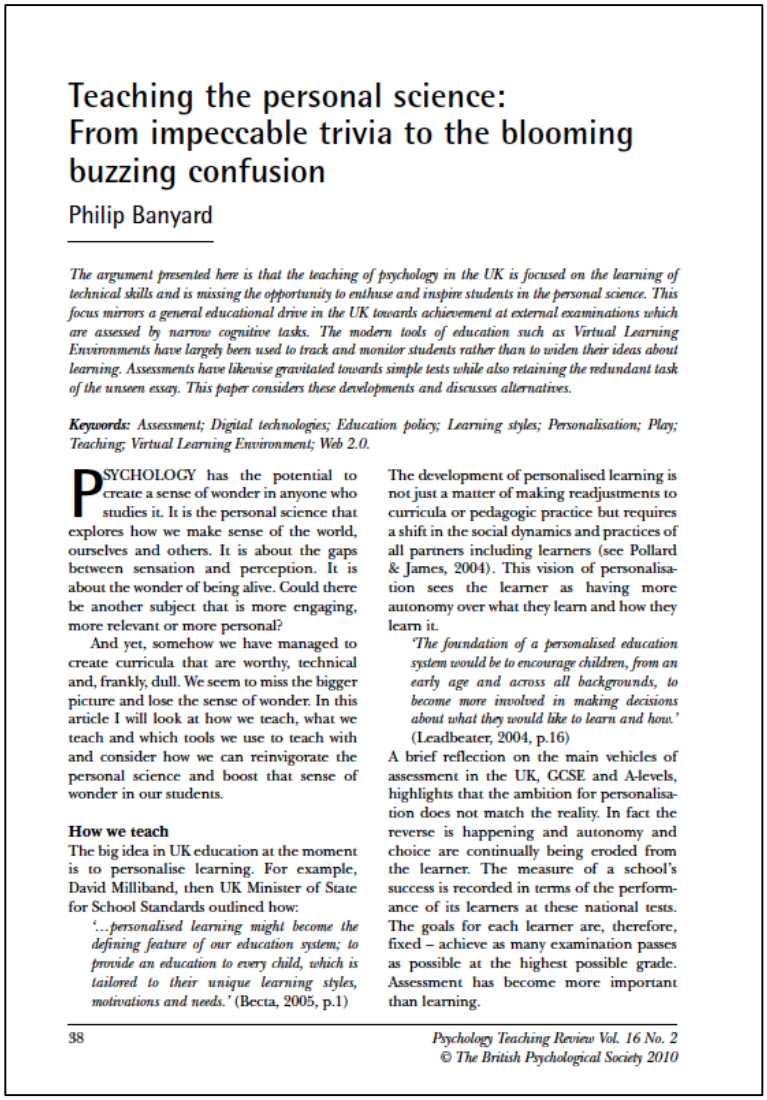


Figure 1: Potential VLE use and actual VLE use for Teacher 1 and Teacher 2

Paper 4

Banyard, P. (2010). Teaching the personal science: From impeccable trivia to the blooming buzzing confusion. *Psychology Teaching Review, 16(2),* 38-44.

(pre-publication version)



Teaching the personal science: From impeccable trivia to the blooming buzzing confusion

Philip Banyard

The argument presented here is that the teaching of psychology in the UK is focused on the learning of technical skills and is missing the opportunity to enthuse and inspire students in the personal science. This focus mirrors a general educational drive in the UK towards achievement at external examinations which are assessed by narrow cognitive tasks. The modern tools of education such as Virtual Learning Environments have largely been used to track and monitor students rather than to widen their ideas about learning. Assessments have likewise gravitated towards simple tests while also retaining the redundant task of the unseen essay. This paper considers these developments and discusses alternatives.

Keywords: *Assessment; Digital technologies; Education policy; Learning styles; Personalisation; Play; Teaching; Virtual Learning Environment; Web 2.0.*

PSYCHOLOGY has the potential to create a sense of wonder in anyone who studies it. It is the personal science that explores how we make sense of the world, ourselves and others. It is about the gaps between sensation and perception. It is about the wonder of being alive. Could there be another subject that is more engaging, more relevant or more personal?

And yet, somehow we have managed to create curricula that are worthy, technical and, frankly, dull. We seem to miss the bigger picture and lose the sense of wonder. In this article I will look at how we teach, what we teach and which tools we use to teach with and consider how we can reinvigorate the personal science and boost that sense of wonder in our students.

How we teach

The big idea in UK education at the moment is to personalise learning. For example, David Milliband, then UK Minister of State for School Standards outlined how:

> *'…personalised learning might become the defining feature of our education system; to provide an education to every child, which is tailored to their unique learning styles, motivations and needs.'* (Becta, 2005, p.1)

The development of personalised learning is not just a matter of making readjustments to curricula or pedagogic practice but requires a shift in the social dynamics and practices of all partners including learners (see Pollard & James, 2004). This vision of personalisation sees the learner as having more autonomy over what they learn and how they learn it.

> *'The foundation of a personalised education system would be to encourage children, from an early age and across all backgrounds, to become more involved in making decisions about what they would like to learn and how.'* (Leadbeater, 2004, p.16)

A brief reflection on the main vehicles of assessment in the UK, GCSE and A-levels, highlights that the ambition for personalisation does not match the reality. In fact the reverse is happening and autonomy and choice are continually being eroded from the learner. The measure of a school's success is recorded in terms of the performance of its learners at these national tests. The goals for each learner are, therefore, fixed – achieve as many examination passes as possible at the highest possible grade. Assessment has become more important than learning.

Teaching the personal science: from impeccable trivia to the blooming buzzing confusion

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Abstract

The argument presented here is that the teaching of psychology in the UK is focused on the learning of technical skills and is missing the opportunity to enthuse and inspire students in the personal science. This focus mirrors a general educational drive in the UK towards achievement at external examinations which are assessed by narrow cognitive tasks. The modern tools of education such as Virtual Learning Environments have largely been used to track and monitor students rather than to widen their ideas about learning. Assessments have likewise gravitated towards simple tests while also retaining the redundant task of the unseen essay. This paper considers these developments and discusses alternatives.

Keywords

Assessment
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Play
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Virtual Learning Environment
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Psychology has the potential to create a sense of wonder in anyone who studies it. It is the personal science that explores how we make sense of the world, ourselves and others. It is about the gaps between sensation and perception. It is about the wonder of being alive. Could there be another subject that is more engaging, more relevant or more personal?

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So what of this personalised learning? The rhetoric is still used but it refers not to the goals or the content of education but only how you chose to deal with those goals and that content (Banyard et al, in press).

The interesting distinction here concerns control, and hence power. The critical discourse analyst, Norman Fairclough (1989) describes the process of synthetic personalisation where people are given the impression that they are being treated as individuals when they are in fact being treated en masse. Examples of this include the computer generated individualised messages we receive from financial institutions or from politicians, and also the cheery but vacuous *'have a nice day'* we receive from an airline steward. I receive many emails directed to me personally from all sorts of people I have never met and who clearly have no knowledge of me. The illusion given is one of engagement and control over your environment when in fact there are very few options for response. The power is with the designers of the interaction and the sense of control in the user is illusory. In our everyday life we see through this power relationship and recognise the personalisation as synthetic and it would be reasonable to assume that learners can also see through this 'personalised' learning.

We have the added irony in psychology where we provide an opportunity for people to study this personal science in a restricted way. The learners are not given problems to wrestle with or the opportunity to explore the issues they find interesting and relevant. They are not involved in decisions about what they would like to learn or how. Instead they are asked to learn the orthodox cannon of psychology and respond to questions where the answers are already known and they are required merely to regurgitate the information they swallowed previously. It is the impersonal teaching of the personal science.

In his Presidential Address to the BPS, the much missed Tony Gale (1990) challenged us to apply psychology to the teaching of psychology. He painted a negative picture of the way psychologists deal with their own knowledge. In a delightful rant he argues that,

" … we produce passive learners, respecters of authority, and students whose primary purpose in learning is negative reinforcement and the removal of anxiety …" (P, 483)

Gale also looks at the concept of power, and argues that the role of the teacher is to liberate the learner's mind and to shift some of the balance of power from the teacher to the learner. The problem is that we have created all-powerful assessments where the most strategic way of achieving success is to adopt a passive role and learn and reproduce the set answers. The economics of education mean that class sizes are large in schools and colleges and massive in universities. The dynamics of large classes are that the teacher inevitably adopts a more powerful role – 'I have the knowledge, you will listen and take notes.' And the dynamics of assessment mean that the examinations become the purpose of the course rather than a necessary addition. The students therefore see themselves as taking the course in order to get an A Level or to get a degree. The absurdity of this becomes even more pronounced when we consider the nature of these assessments later in the article.

Gale's solution to some of these issues is to radically change the focus of laboratory classes. Commonly these are seen as the opportunity to drill learners in the techniques of research and the precise way to write up research reports. An alternative view would be to try and recreate the primary school class in the laboratory.

"My way of learning how to be a psychologist is to provide students with a playroom and appropriate resources. Every student should be able to sample, at their leisure, the principal approaches to measurement and their application within substantive areas." (p. 486)

This approach focuses on the intrinsic pleasure of finding things out by doing them and of illuminating the wonder of psychology for our students.

Play is a complex concept to define and in part it is a matter of self-definition (Wood and Attfield, 2003), but for our purposes here lets see it as a contrast to work. If we see work as serious, purposeful, useful, and worthy, then play is fun, and not necessarily purposeful, useful, or worthy. And yet it is clear that children develop cognitive and emotional skills through play and probably rather more than they do through work (Wood and Attfield, 2003). The value of play can be seen in the new technologies that are being introduced into schools such as the interactive whiteboard. Children describe how they enjoy using this technology and describe some of the learning activities as play (Hall & Higgs, 2005). It is this approach that we can bring to our teaching in HE and if we follow Gale's idea we will turn all laboratory sessions into play-time.

Teaching tools

If we are to personalise our teaching perhaps we can use the new technologies to do this. One of the major innovations in teaching over the last decade has been the roll out of digital technologies. This has been achieved with considerable investment by the UK government. And with that investment has come an expectation, and maybe a demand, that the technology will bring measureable improvements in educational performance. Each new major development, for example the roll out of broadband in the early part of the decade, was seen as the technology that would kick start major

improvements in performance. In a keynote speech, Ruth Kelly, Secretary of State for Education and Skills said,

"I see ICT and its potential to transform how we teach, learn and communicate as crucial to our drive to raise standards." (Kelly, 2005, p.2)

More recently Ed Balls (then Secretary for Children, Schools and Families), commented on his website that,

"Computers are no longer a luxury for the few, but these days are just as essential a part of education as book, pens and paper." (Balls, 2010)

While policy makers have taken it as given that digital technologies will enhance education and the general economy they have struggled to obtain the evidence to support this *optimistic-rhetoric* (Reynolds, Treharne & Tripp, 2003). It became clear that the introduction of digital technologies could have negative as well as positive effects. The reanalysis of the internationally comparative data on educational performance PISA (Programme for International Student Assessment) in a number of OECD countries found that computer availability at home could actually be detrimental to educational performance, while computer availability at school was found to show no discernible positive effect (Fuchs & Woessmann, 2005).

Research programmes carried out at Nottingham Trent University over the last ten years (e.g. Underwood, et al. 2005, Underwood, et al., 2008a) have looked at the level of IT activity and embeddedness in schools and compared this with the performance of these schools on standard academic indicators. These standard measures of performance, such as SATs and GCSE have resolutely resisted the impact of technology and largely failed to show any major effect. Technology alone was not the answer.

Virtual Learning Environments

The focus of educational technology in the UK at the moment is on the roll-out of virtual learning environments (VLE). It is a requirement for all schools to have one. The VLE is a self evidently good idea but does it deliver as much as it promises and what are the key benefits and also the key barriers to success? The VLE offers the potential for interactive learning and could empower the student. In reality this is not how the VLE is used.

When we examine the VLE as an educational tool we can observe different layers of control. Verpoorten et al. (2009) defined four types of 'control' within VLEs:

> *System control*, which includes what a VLE looks and feels like as well as how it works
>
> *Organisation control*, which includes the ways that the VLE is customised by the organisation and the restrictions placed on use
>
> *Teacher control*, which includes the educational structure of the VLE such as the files and tools that are made available
>
> *Learner control*, which includes the ways that the learner can take control of their own learning.

The learner has only limited control in this hierarchical set-up. Our research at Nottingham Trent University (e.g., Underwood et al, 2008b) over the last ten years has witnessed the initial stuttering introduction of VLEs before the current mass roll-out. In surveys, interviews and focus groups with teachers, learners and managers

we have recorded the varying responses that these groups have to the technology. While it is clear that the VLE is an excellent medium for tracking student performance and for providing access to resources it is apparent that it does not deliver the more personalised and interactive experience that the social networking facilities such as Facebook provide.

Not everyone is signed up to the VLE experience, and it is argued that the VLE can not create a truly personal learning environment (Holah & Davies, 2009). In fact, by being so controlled the VLE restricts the options of the learner and is also in danger of deskilling teachers by providing routine and limiting structures within which to teach. The question as identified by Holah and Davies is whether one size fits all. The VLE effectively defines a limited path through the new technologies and does not empower learners to facilitate their own learning using the new technologies.

This gap between the learning and formal educational technology is also noted in the Harnessing Technology Report (Smith & Rudd, 2008),

"Levels of access to and use of technology are high among young learners – especially out of school. However, their experience of technology in formal education generally differs from that at home and there are increasing indications that learners' expectations of technology, and, as a result, of learning, are not being met. Learners commonly report that they enjoy learning with technology, and increasingly use a range of tools and approaches to support their learning, including the use of Web 2.0 technologies, which may not be recognised and supported in formal settings." (page 23)

An alternative to the VLE is to enable learners to make best use of all the technologies available in Web 2.0. The opportunities to communicate, collaborate and publish that are available in cyberspace can expand the opportunites and ideas of the learner rather than restricting them. An example of the power of this approach is a facility created by Holah and Davies for teachers of psychology. Psychexchange (www.psychexchange.com) allows teachers to upload and comment on teaching resources, ideas and videos. Since it was created in 2008 it has created a large and active community of psychology teachers. It has over 24,000 users of which 7,000 have been active in the last month (accessed July 2010). There are 4,200 files uploaded and these have been downloaded over 1,000,000 times. A community of practice has been created within a short time that allows teachers to share resources and good practice.

Assessment

One of the other key tools in education are assessments. These assessments are still largely conducted in the UK using traditional (i.e. pre-digital technologies) techniques, and focus on traditional (i.e. pre-digital technologies) academic skills. The origin of these techniques in UK education can be traced back through the University of Cambridge Local Examinations Syndicate (UCLES) to 1858 when a group of academics were invited by some Durham schools to develop assessment techniques for their pupils. The lessons were observed in order to capture how the pupils were being taught. Tests were devised to match the teaching and learning that was taking place. The techniques for external examination are largely the same today even though the style of teaching and learning has moved on dramatically. There is a clear need to create assessments that better measure the shifts in learning activities that accompany effective use of digital technology. For example

what form of assessment best captures the move from essay to story boarding or the rise in visual as opposed to verbal presentational skill.

The examination essay is seen as the untouchable gold standard of assessment. When I was at university this assessment mirrored how I might create a written piece. I would do the research, prepare the notes and then write the essay as a single and final piece. At coursework and at examination the process was similar. Today I would never construct a piece like that. I draft and edit, draft and edit. And our students will never have experience of this traditional process except when they are being assessed in examination. For their coursework they are required to create their work digitally using the technology of the computer and the writing style of draft and edit. This in part mirrors their learning. In their examinations however, they are assessed using the technology of the Biro using a writing style that is unique to the assessment process. What validity can we claim for this process? The assessment does not match the learning and does not even relate to anything that they will be required to do when they leave school or university. It is indefensible but constantly defended.

In addition to the validity issue about the examination there is a reliability issue. The reliability of essay marking has been seriously questioned for a long time (e.g. Jones, 1938, Newstead & Dennis, 1994). One solution to the reliability issue has been to introduce double marking and this has been found to be increase reliability (Brooks, 2004) but the dramatic increase in UK psychology undergraduates during the last decade has made this process impracticable in many universities. So in summary we are basing the key assessment of an individual on a measure with poor reliability and questionable validity.

The solution is to stop defending the indefensible and instead struggle with the difficult task of devising assessment that are valid measures of the learning we require our students to do.

The difficulty in addressing assessment is that it performs two major functions. First it provides an indication to the student of their progress and allows them to reflect on their work and adjust their learning. Secondly, performance on assessments is used to examine the perceived effectiveness of teaching at the level of the individual teacher and also at the institutional level. This second point makes it strategic for teachers to provide assessments that are easy to administer and easy to teach to. This approach makes it strategic to ‘teach to the test’ (Halonen et al., 2003) and in so doing minimise the more sophisticated and subtle aspects of student learning.

The strategic approach to assessment will influence the student learning (Conner-Greene, 2000) as it becomes strategic for the student to focus on the text and we end up with a spiral into meaningless assessments where …

> *“students may not engage in more advanced kinds of study skills because the course exams and other assignments simply do not demand it.…Teachers may verbalize the need for students to develop more sophisticated study strategies but do not provide the demands and practice that would promote this development.”* (Bol & Strage, 1996, p. 159)

What we teach

Psychology’s greatest contribution is arguably the education it provides to millions of people that allows them to reflect on their behaviour and the behaviour of others. Research in psychology has illuminated our understanding of a number of issues but it has not delivered great insights or innovations in the way that the other sciences

have. A good exercise is to try and list the great findings and innovations of the last one hundred years of psychology. Better still, ask delegates at a research conference to do the same.

Psychologists might have developed psychometric tests, conditioned reflexes, factor analysis and psychoanalysis but they hardly match up to the transformational developments in other sciences such as gunpowder, the steam engine, computers, atom bombs and the contraceptive pill. The common response to this charge is that psychology is a young science, but we are now over 150 years old. Not so young anymore. There are also other young sciences that have produced transformational ideas or technology, for example from electronics we now have the microchip which has transformed our daily lives and from genetics we have the human genome.

Despite this lack of great findings our courses and teaching concentrate on data and techniques. The search for ever greater scientific rigor has led to curricula that focus on precisely doing meaningless tasks to come up with idiosyncratic findings. This focus of teaching mirrors the research process where we witness,

" the fetishisation of psychological method, or […] the impeccable trivia that consume so many journal pages." Reicher & Haslam, 2009, page 469

Psychology has the potential to produce a Wow! factor. Some curriculum designers acknowledge this. Look at the subject criteria for psychology courses at GCSE level published by QCA. The first learning outcome they identify states,

"[Courses in psychology] … must encourage learners to be inspired, moved and changed by following a broad, coherent, satisfying and worthwhile course of study and to gain an insight into related sectors such as science. They should encourage learners to develop a personal interest and enthusiasm for psychology and prepare them to make informed decisions about further learning opportunities and career choices." GCSE subject criteria for psychology, QCA 2007, page 3.

Further learning outcomes are to *"develop an awareness of why psychology matters" (page 3), and "develop and understanding of the relationship between psychology and social, cultural, scientific and contemporary issues and its impact on everyday life."* (page 4).

This document goes on to outline the essential components of courses at this level gives clear guidance about the core content of psychology. Syllabuses based on these principles will provide a basic introduction to the subject with a challenge to explore the wonder of psychology.

Big questions

At the heart of psychology are the big questions such as 'Who am I?, and why do I think, feel and behave like this?'. What bigger challenge can we give to our students than to start from these questions as they begin to explore psychology?

One of those big questions, framed for us by William James concerns how we make sense of the "blooming, buzzing confusion." Our students are also faced with a blooming buzzing confusion in the information in front of them about themselves and about psychology. We can encourage their sense of wonder and their skills of exploration and discovery or we can teach them to be precise in their reporting and to know what kurtosis is and how to look for it. I fear that for our students, what starts as a "blooming, buzzing confusion" ends up as a dull recitation of "impeccable trivia".

This article is a homage to Tony Gale and I hope he would appreciate the ranting element of it. He inspired many students and psychologists including myself, and when I look at my own career I like that I have tried to provide inspiration and challenge to my students. I lose no sleep at all about whether they know what kurtosis is or if they can explain the usefulness Roy's Largest Root (see your ANOVA outputs). Despite the Macdonaldisation of our education system (Ritzer, 1993) there is still room to allow our students to personalise their study of the personal science and to dive into the blooming, buzzing confusion of psychological knowledge.

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Paper 5

Banyard, P., Underwood, J., & Ault, A. (2006). Do enhanced communications technologies inhibit or facilitate self-regulated learning? *European Journal of Education, 41(3/4),* 473-90.

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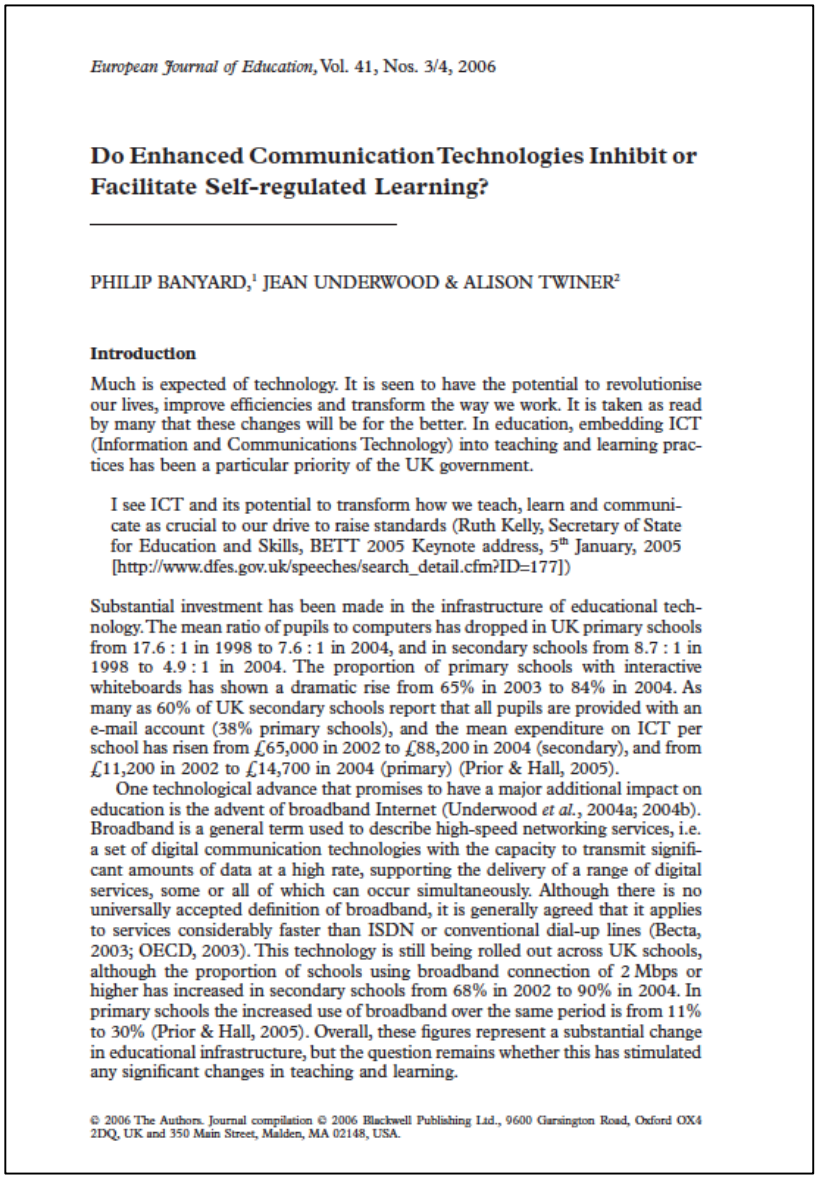

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Do Enhanced Communication Technologies Inhibit or Facilitate Self-regulated Learning?

PHILIP BANYARD,[1] JEAN UNDERWOOD & ALISON TWINER[2]

Introduction

Much is expected of technology. It is seen to have the potential to revolutionise our lives, improve efficiencies and transform the way we work. It is taken as read by many that these changes will be for the better. In education, embedding ICT (Information and Communications Technology) into teaching and learning practices has been a particular priority of the UK government.

> I see ICT and its potential to transform how we teach, learn and communicate as crucial to our drive to raise standards (Ruth Kelly, Secretary of State for Education and Skills, BETT 2005 Keynote address, 5th January, 2005 [http://www.dfes.gov.uk/speeches/search_detail.cfm?ID=177])

Substantial investment has been made in the infrastructure of educational technology. The mean ratio of pupils to computers has dropped in UK primary schools from 17.6 : 1 in 1998 to 7.6 : 1 in 2004, and in secondary schools from 8.7 : 1 in 1998 to 4.9 : 1 in 2004. The proportion of primary schools with interactive whiteboards has shown a dramatic rise from 65% in 2003 to 84% in 2004. As many as 60% of UK secondary schools report that all pupils are provided with an e-mail account (38% primary schools), and the mean expenditure on ICT per school has risen from £65,000 in 2002 to £88,200 in 2004 (secondary), and from £11,200 in 2002 to £14,700 in 2004 (primary) (Prior & Hall, 2005).

One technological advance that promises to have a major additional impact on education is the advent of broadband Internet (Underwood *et al.*, 2004a; 2004b). Broadband is a general term used to describe high-speed networking services, i.e. a set of digital communication technologies with the capacity to transmit significant amounts of data at a high rate, supporting the delivery of a range of digital services, some or all of which can occur simultaneously. Although there is no universally accepted definition of broadband, it is generally agreed that it applies to services considerably faster than ISDN or conventional dial-up lines (Becta, 2003; OECD, 2003). This technology is still being rolled out across UK schools, although the proportion of schools using broadband connection of 2 Mbps or higher has increased in secondary schools from 68% in 2002 to 90% in 2004. In primary schools the increased use of broadband over the same period is from 11% to 30% (Prior & Hall, 2005). Overall, these figures represent a substantial change in educational infrastructure, but the question remains whether this has stimulated any significant changes in teaching and learning.

Do enhanced communications technologies inhibit or facilitate self-regulated learning?

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Abstract

The assumption tested here is whether the introduction of enhanced communication technologies in the form of high-speed broadband connectivity has removed or ameliorated any of the barriers to efficient and effective teaching and learning.[5]

Evidence is presented of how enhanced communication technologies have facilitated self-regulated learning. The examples are drawn from a range of subject areas in secondary (11-18 years) and primary (5-11 years) schools in the UK. Evidence is also presented of the new challenges to self regulated learning that are created by enhanced communication technologies for example, non-selective searching, plagiarism and issues of filtering.

Case studies were developed in 37 schools in the public sector, from rural and urban areas. Field workers conducted interviews with teachers and made classroom observations. Further interviews were also conducted with headteachers and ICT co-ordinators.

These studies showed some outstanding examples of students taking ownership of the learning process. However, these enhanced communication technologies raised concerns for school management, for teacher workloads and for the parents. These findings are not parochial. International comparisons indicate that we are studying a trans-national phenomenon. Similarly costs and benefits of such technologies are not sector specific; the outcomes of this research can inform debate in higher education.

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Keywords: *technology-enhanced learning environments; self-regulated learning; e-Learning; motivation; learning strategies; teacher training; ICT in teacher education.*

Introduction

Much is expected of technology. It is seen to have the potential to revolutionise our lives, improve efficiencies and transform the way we work. It is taken as read by many that these changes will be for the better. In education, embedding ICT (Information and Communications Technology) into teaching and learning practices has been a particular priority of the UK government.

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schools using broadband connection of 2Mbs or higher has increased in secondary schools from 68% in 2002 to 90% in 2004. In primary schools the increased use of broadband over the same period is from 11% to 30% (Prior & Hall, 2005). Overall, these figures represent a substantial change in educational infrastructure, but the question remains whether this has stimulated any significant changes in teaching and learning.

The economic imperatives behind the rollout of broadband technologies in both educational institutions and European society as a whole have been clearly articulated. OECD (2003) emphasises that education alongside other government provided services can potentially benefit from the use of broadband and should be given priority in government strategies. However, helping the knowledge economy thrive is not the central intention of either teachers or pupils who go on-line. The focus for educational stakeholders is to consider how broadband will support the educational process and how it will bring about valued educational outcomes. Critically here we are asking to what extent this technology will support and encourage new styles of learning allowing greater automomy and self-regulation for students of all ages.

Policy makers take it as given that broadband technology will enhance education and the general economy but it should be noted that there is another view which argues that no substantial evidence has been brought forward to support this *optimistic-rhetoric* (Reynolds, Treharne & Tripp, 2003). The formal research evidence for beneficial effects of ICT in the classroom is not convincing despite the fact that teachers and pupils 'know' good things are happening (Cuban 2001). It is therefore necessary for research to establish the specific benefits or otherwise of ICT and e-learning. It is becoming clear that providing ICT equipment of itself is not enough to stimulate educational advances. Indeed, in some circumstances a focus on the ICT resources may inhibit learning. The reanalysis of the internationally comparative data on educational performance PISA (Programme for International Student Assessment) in a number of OECD countries found that computer availability at home could actually be detrimental to educational performance, while computer availability at school was found to show no discernible positive effect (Fuchs & Woessmann, 2005). Initial analysis had suggested a positive effect of computers but when variables such as background and resource level were taken into account the

mere availability of computers did not translate into higher student performance. They observed a surprising inverted-U-shaped curve for performance against frequency of computer use:

- Little computer use, poor performance.
- Moderate computer use, higher performance.
- Frequent computer use, poor performance.

Fuchs and Woessmann suggest that this is a case of effective teaching methods being displaced by time in front of computer screens.

This conflict between the political ambition for broadband to be a driver of educational change and the failure to demonstrate clear performance benefits makes it even more important to identify and measure the specific changes and benefits that the technology can be shown to achieve. One specific perceived benefit of e-learning is that the learner can take greater control over their learning and so will enhance their self-regulation. An issue for research, then, is to find a way of establishing the impact of ICT on self-regulated learning.

The concept of Self-regulated Learning (SRL) has emerged from the more extensive literature on Self-regulated Behaviour (SRB). Self-regulation refers to the processes involved in attaining and maintaining goals, where goals are internally represented desired states (Vancouver, 2000). SRB involves: goal establishment including adopting, adapting or rejecting goals; planning that is preparing to pursue a goal; striving which is moving toward or maintaining a goal; and finally revision which encompasses the possibility of changing or disengaging from a goal (Austin & Vancouver, 1996).

Self-regulated Learning is a subset of that more general concept of SRB. Self-regulated learners draw on their knowledge and beliefs to devise an interpretation of a given academic task. These learners will set goals and think about the skills and strategies for achieving these goals. They monitor their progress toward the goals by judging their success against these goals (Zimmerman, 1989), and they recognise deviations from their expected rate of progress. SRL focuses on academic performance as students strive for academic success. However, while traditional models of SRB assume that the behaviour is structured by individual goals and needs with limited influence from others or the environmental context (Jackson,

MacKenzie & Hobfoll, 2000), in the special case of self-regulated *learning* the influence of factors outside of the self are much greater.

One way in which broadband technology might influence the development of SRL is through enhanced motivation to learn. There is evidence that certain types of motivational beliefs help to promote and sustain self-regulated learning (Pintrich, 1999). Self-regulated learning requires greater effort from the learner so motivation is a crucial issue. It is suggested that the following three features of motivational beliefs can promote self-regulated learning;

> *Self efficacy*; students who believe they can learn and are confident in their skills are more likely to report the use of self regulatory strategies
>
> *Task value beliefs*; students who believe their academic tasks are interesting, important and useful are more likely to report using self-regulatory strategies,
>
> *Mastery goal orientation*; the goal of learning and mastery appears to promote self-regulated learning more than external goals such as getting good grades (Pintrich, 1999).

Motivation is an important contributing factor to educational success and to self-regulated learning, and broadband technologies can promote that motivation. There is evidence showing that motivation is stimulated by advanced technologies. Becker (2000) found that teachers who used engaging technology-enhanced lessons reported that students were motivated to continue using computers at other times of the day, both inside and outside of school hours. Harris and Kington (2002) present case studies that illustrate how teachers exploit the capabilities of ICT to introduce new approaches that have beneficial impacts on students, such as improved motivation, increased confidence and self-esteem, enhanced social skills, improved group-working and co-operative skills, and enhanced achievement. One of the case studies outlined how students on an online vocational course developed increased independence and motivation for autonomous styles of learning.

There is not, however, universal endorsement of the benefits of self regulated learning. There is a suggestion that self-regulated learning is just for the high performers. For example Nenniger (2005) writes

"Even a glance at characteristic samples of the different studies ……. reveals that most studies include participants who tend to be academically talented, highly

educated or skilled learners in more or less academic contexts. (Nenniger, 2005, p.240)

If this is the case then it will add to the concerns in the UK that broadband will open up a digital divide (Demos, 2004) in that the technology is more available to those with the means and the motivation to pay for it. Far from advancing an inclusion agenda it may be that broadband technology is further excluding the educationally disenfranchised.

Another concern about the effects of broadband technology on SRL is evidenced by Wood in his account of the use of ICT across the European Union. Wood highlights observations in French classrooms which recorded that *"learners often downloaded materials found on the Internet but then went on to assemble them with no evidence of structure, leaving any audience or 'reader' in doubt as to what the 'writer' had in fact written themselves and what they had meant to add (if anything) to what was copied*." (Wood, 2003, p.16). Similar findings have been reported by Somekh et al (2004) in the UK. Further, Wood goes onto argue that if this pattern of behaviour is the norm in classrooms then we should not expect any impact of this use of the technology on general measures of scholastic performance in our schools. Downloading materials without thought lead inevitably to plagiarism. Plagiarism is a well established educational problem but new technologies have exacerbated the problem. The Internet has changed the dynamics of dishonest academic practice; access is no longer for the knowing few but is there for the majority. There is evidence that some students are willing to take these opportunities to cheat (Underwood, 2003; Underwood & Szabo, 2003). Indeed, in McCabe's 2001 study of some 4,500 US schools, 74% of students admitted to serious test cheating; 72% admitted to serious cheating on written work; 97% admitted to copying homework or to test copying; 30% admitted to repetitive, serious cheating on tests/exams; 15% had obtained a term paper from the Internet; 52% had copied a few sentences from a website without citing the source.

This paper draws on the broadband research to consider whether enhanced communications technologies such as broadband inhibit or promote enhanced

educational experience for learners and, in particular, whether they promote self-regulated learning.

Method

The research was commissioned by the British Educational Communications and Technology Agency (Becta) to investigate the impact of broadband technologies on UK schools. Three sources of data were identified:

- Interviews provided by the staff of the sample schools including the head teacher, the designated teacher facilitator and two classroom teachers;
- Classroom observations collected by the broadband research team; and,
- Statistical data on school performance available in the public domain. Drawing on nationally accessible performance data for the broadband schools, each school was evaluated against itself pre and post the implementation of the broadband policy within that institution.

This report draws mainly on the field study observations to report on the impact of broadband on self-regulation activities in the classroom.

Sample

The schools in this study formed a hybrid-sample which at the first level of access was opportunistic rather than stratified in that we accepted schools willing to take part, but in addition all schools had to meet the connectivity criterion of at least 2Mbps. The likely bias towards schools with a positive attitude towards broadband /ICT was not judged to be an issue because of the core aim which was to establish the potential of broadband rather than to survey its current use. Thirty-seven schools were recruited from eight Regional Broadband Consortia (RBCs) within England and included 19 primary, 3 middle and 15 secondary schools.

The schools varied by phase of education and level of their ICT resources, level of implementation of broadband and length of implementation of broadband within the institution. Twenty–eight out of the thirty-seven schools had computer to student ratios of less than one to ten and this included all but one of the secondary schools. Provision in the primary schools was more varied ranging from one computer for every two pupils to two computers per 30 pupils. All schools had a minimum 2 Mbps

level of connectivity, which is the criterion level for broadband connectivity set by the Department for Education and Skills, and eight schools had at least 10 Mbps. The length of time the individual schools had received broadband connectivity varied from a few months to just over six years.

A field researcher was assigned to each of the sample schools to ensure clear lines of communication and to strengthen relationships with the schools and each school designated a teacher facilitator to act as both the contact person and also as a guide to the field researcher on their visits to schools.

Research instruments

The first set of instruments solicited data from the staff of the sample schools. A semi-structured interview schedule was designed to elicit the head teachers' attitudes to and perceptions of the impact of broadband on their schools. Impacts on technical and organisational infrastructure, on staff and pupil attitudes and behaviour, and finally on learning outcomes were probed through this schedule. All interviews were conducted by telephone.

A pivotal role in the evaluation was that of the teacher facilitators who were identified in each school to work alongside the broadband team. This facilitator was often, but not necessarily, the ICT co-ordinator. Each teacher facilitator completed an electronic questionnaire designed to elicit baseline data on the general ICT facilities within each school, on the timing of the implementation of broadband into the school and on the use of facilities within the school. This questionnaire was designed to be completed before the field researcher visited the school and was to form the basis of the interview conducted by the field researcher on that visit. The purpose of the interview was to clarify the information provided within the questionnaire and to probe more deeply on interesting issues arising from that information.

The teacher facilitator had a further key role in identifying two teachers who were active, and in the school's opinion, effective users of broadband. The work of these teachers was deemed to represent best practice cases and therefore be indicative of the potential of broadband. Each of the identified teachers collated a portfolio of students' work to exemplify the work undertaken by their pupils or examples of their own teaching preparation. In addition they completed a weekly record of their own broadband associated activities for two weeks of the project. Furthermore, one

lesson for each identified teacher was observed and discussed with that member of staff by a broadband field researcher using a classroom observation and interview schedule. In total seventy-two lessons were observed by the field researchers. Of key importance to the teacher interviews was the teasing out of teachers' perceptions of the nature of any changes in their approach to teaching a given topic pre and post the advent of the broadband implementation.

From the semi-structured interviews with teacher facilitators and the identified teachers, the field researchers prepared individual case study reports for each school using a case study report form as a guideline.

Results

The evidence presented here is selected from the observation records of the field researchers' notes to illustrate the impact of broadband technology on teaching and learning. The selected data exemplify the range of classroom observations and are presented to show the impact on motivation, self-regulatory behaviours such as monitoring and planning, and to also show some of the inhibiting features of the technology.

1. Motivation

The motivating impact of ICT/broadband was commented on by all of the field researchers and many of the teachers who were interviewed. This motivation was shown in many ways.

1.i Enthusiasm

The most visible demonstrating of motivational benefits were in the primary lessons that were characterised by enthusiasm and excitement. For example an ethnically diverse inner city class of lively eight year olds were observed playing a mathematical game provided on the virtual learning portal and using an electronic whiteboard. The pupils were very motivated, standing up (with hands in the air) keen to interact and provide answers. However, the lesson was under complete control because they knew the 'class rules' for interaction. The pupils were all engaged in the task, and the atmosphere was akin to a football match with the anticipation of winning the challenge with the machine. The positive attitude generated in the class game period was maintained in the individual bookwork and the pupils were really disappointed when they had to stop.

The activities observed could arguably have been created on card in order for the pupils to play the mental mathematics game. There were however a number of aspects that enhanced the experience beyond this basic level. The game on the web site had animation that motivated the pupils to interact and this was further stimulated by the immediate feedback to pupils' responses. Significantly, that feedback was devoid of emotion, since the machine delivered it rather than the teacher, so the pupils responded more good humouredly when they were wrong. This and the collective use of the electronic whiteboard meant pupils were able to learn from the responses of others.

1.ii Respect

At one secondary school the ICT facilitator and Deputy Head commented on the unusual respect shown for the ICT facilities and equipment by the pupils saying that there had been *"no mouse balls nicked".* The ICT facilitator saw this achievement as being an indication of the high regard the pupils had for the ICT facilities and the way they were managed. In a rural ex-mining village with ongoing industrial decline and relatively low educational achievement and expectation, this indicator of involvement and respect for education is not trivial. Other schools also reported a decrease in unacceptable behaviour when pupils were using ICT equipment.

1.iii Interest

Broadband can have a major impact on the interest level of lessons. At its simplest level the Internet is used as a source of information both for teachers and pupils. The range of material that can be captured is increased, of course, by broadband. For example at one secondary technical school the field researcher observed seven special needs pupils who were investigating tessellation and creating tangrams using a special piece of software recommended through curriculum on-line. He noted that pupils were highly motivated as they experimented with different scenarios and worked independently. Similarly at another primary school a year four group using web-resources for whole class practice in numeracy skills. This field researcher also reported on the enthusiasm and the sustained involvement of the pupils throughout the lesson. The use here of a number of resources required expert management by the teacher, but the observer concluded that the variety of activity and speed of transition from one activity to the next could not have been achieved without the resources released by the Internet environment. The fast access to ready materials

enabled the teacher to maintain the pace of the lesson and the sustained enthusiasm of the pupils.

1.iv Necessity

The old adage necessity is the mother of invention can be applied here. The limitations of the technological environment create a need for greater motivation in the learners. For example a post-sixteen psychology lesson in a rural secondary school was observed being delivered by a video link with a Further Education (FE) college. FE colleges in the UK provide a range of vocational courses for post-16 students. In addition, there is an overlap of provision with secondary schools in areas such as GCE A Levels (General Certificate of Education, Advanced Level) which are the standard qualifications for university entrance. The video link was set up by the technician and the pupils sat where they could see the screen and be seen by the camera. The remote teacher used the video link to show a PowerPoint presentation and break it down to discuss various points. There was no teacher from the local school present to start with, though the teacher who supports the subject came in later to observe the lesson and contribute.

The pupils and the teacher seemed well able to deal with the slight time delay on the signal and continue a constructive and amusing discussion (for a review of the technical issues see Anderson, 2000). The pupils were able to contribute without being asked and the discussion was lively and interesting. By coincidence the field researcher was an experienced examiner for this course and observed that the discussion was richer than many AS classes. The lesson had a strong positive emotion, and the pupils were talking about the material before the lesson started and after it had ended. The unusual delivery of the lesson facilitated new strategies of classroom behaviour.

2. Self-regulatory behaviours

If the new technologies are directly enhancing self-regulated learning it should be possible to find examples of new opportunities for learners to set goals, think about the strategies for achieving these goals and monitor their progress. The field researchers recorded many examples of this which are illustrated by the following observations.

2.i Planning and responding

The enhanced technologies can facilitate a radical change of practice. An observation of two year nine pupils (13-14 year olds) from a class of twenty is indicative of teachers using the technology as an organisational tool to distribute and comment on pupils' work. This field-study also confirms that there is a growing ICT skills base and a sophisticated etiquette of working among pupils in ICT rich environments.

In our next case concerning pupls in a UK secondary school (11 to 18 years) a girl entered the classroom and logged onto the school intranet to continue working on a project which she began by reviewing her progress to date. She then logged onto the Internet and, using a search engine, located a short list of useful sites. One particularly useful site contained some audio content and, not wishing to disturb other pupils she obtained a set of headphones from a technician. Having made notes from the audio files she then used these as a basis for her work, drafting and re-drafting appropriately, saving her work to her personal folder on the intranet. Adjacent to her sat a boy with no visible work materials. Working on-line he located the comments and suggestions that his teacher had provided, using this advice he adapted his text and saved the revised version to his folder. He then began work on the new task that he had received from his teacher. He too logged on to the Internet and copy and pasted various items from a chosen range of web sites. He saved this as a rough draft in his personal folder and e-mailed his teacher to confirm that he had completed the work set.

These two pupils illustrated a range of personal decision making and organization skills in completing the tasks allocated to them.

2.ii Monitoring and reflecting

One rural secondary school provided two examples of developing self-regulatory skills first by providing tools for self-reflection and assessment, and secondly by exposing work to expert external opinion. In physical education, students were seen to use video in dance and drama sessions to capture, analyse and refine their performances. These materials are archived as a library of clips, providing a growing learning resource. The music department has used the upgraded facilities to share compositional ideas on a music website. The students post music on a chatboard then work on samples that are internationally shared. Students working in these subject areas are encouraged to develop digitised examples of their music and

dance to a theatre group in London. The experts in London work on the students' raw ideas and there is an exchange of visions. They comment backwards and forwards - the experts multi-layering images, changing backgrounds, colours of lighting, clothing, and the students comment on changes by email. The end product of this work is a shared CD.

2.iii Self-pacing

A science lesson for year ten pupils at a city technical school illustrates the facilitation of another self-regulatory skill. The pupils were working on unit four of twelve in forensic science and unit five, the science of sports equipment which was originally produced by a Midlands school and is now commercially marketed by Digital Brain and examined by OCR. The course was organised so pupils experienced one practical lesson and three online computer lessons. The pupils worked at their own pace through the units submitting assignments to a VLE. The teacher had no expository role in the observed lesson and was able to concentrate on reviewing and supporting pupils. As the pupils were approaching the end of the unit, many pupils were assessing themselves using the competitive interactive tests. Some were applying their learning of forensic science to solve crimes. Others were writing and editing assignments related to sports footwear.

In conversation with pupils, they felt that this course helped them achieve higher standards. One pupil described the course as a 'voyage of discovery' while others commented favourably on the visual multimedia elements such as the virtual microscope. The on-line simulated experiments were useful to students in the evaluation of their own experiments. Other benefits were the more private contact with the teacher either face-to-face or by e-mail; the ready availability of the material which allowed the students to make up time lost through illness or absence; the safe storage of work saved in the web space; and the ease with which work could be continued at home. The teacher confirmed that he did less teaching and more checking learning, reviewing, and analysing of pupils' work.

2.iv Self-managing the learning enviornment

This next example, again from a secondary school, showed learners working on their own projects in a computer suite. As they worked many of them took the opportunity to open up music websites and listen via headphones. Although these pupils were listening to music they were still on task. Working to music is the norm for many

young people and this did not appear to disrupt these pupils' educational activities. However, the music did take up bandwidth and this activity breached this school's ICT policy. In contrast at another school pupils were allowed to listen to music whilst working. Indeed, with two hour timetable slots, in one observed lesson the class were given official time-out periods to play games or find music, before returning to their work. The use of such breaks has a firm foundation in the psychological learning literature based as it is on the need for moderate arousal levels for explicit learning of the type commonly sought in formal school settings (Yerkes & Dodson, 1908; Kolb & Wishaw. 1996) The decision to allow such 'non-educational' activities is a finely balanced one. It will involve both the philosophy of the school, but also the effective use of a scarce resource and the need to limit the impact on the activities of other pupils as was the case at the first school described above.

At an inner city primary school a year 6 class was observed in a science lesson. The school is in central London and has around 400 children on the roll housed in Victorian buildings. It has a challenging catchment of children with 67% receiving free school meals (nationally 17% - this is commonly taken as an indicator of poverty), 65% from minority ethnic backgrounds (nationally 11%) and 57% with English as an additional language (nationally 8%). There are 40 languages spoken in the school. The aim of the lesson was to revise knowledge on the topic of sound. After an initial presentation to the class the pupils went to their individual workstations where they were able to open the online worksheet, and open an Internet link to a BBC site. They were required to use the information from the website and information from their observation of science experiments in previous lessons to respond to the work sheet which was displayed on their screens. Most of the pupils were able to work effectively on the task for most of the time. Some worked quicker than others and some found the task taxing but most stayed engaged and productive throughout the lesson. The pupils were able to attempt a sophisticated task that would have been difficult to achieve using conventional resources. The task allowed all students in the class to achieve and the structure and pace of the lesson meant that most pupils were productive throughout. The broadband technology made the topic of sound come alive to the pupils as they could play with it at their workstations. The confidence of the pupils with the technology was remarkable, and they showed great willingness to help each when fellow pupils got stuck.

2.v Restructuring the learning environment

A further step in self-regulating learning is achieved through VLEs. These are still not common in UK schools but field researchers did observe their usefulness and attractiveness to learners and teachers. At a Midlands secondary school the Head of Science has chosen an on-line Applied Science course for his year 10 learners. This course is rich in interactivity and simulation and it allows students to manage their learning more independently. The course provided some webspace for each learner to take work to and from home, submit assignments to school and not just their science work. Home access was used regularly by these students, who were very clear that having private access helped them work harder. For them it was a way of not losing which remained pristine in digital form rather than being "dog-eared" and the work they had to do was always there and in the teachers words and not in scrappy notes in their homework diaries. Interestingly, the learners were using their webspace for other courses than science and had effectively turned it into a VLE for all their studies.

The nature of teacher pupil interaction was affected by the structure of the course which had pupils working at on-line courses at their own pace, determining partly what they do. The pedagogy of classroom activity when pupils are working on-line in this way seems to be in conflict with tight nature of whole class teaching as described by the UK government strategies and evaluated by Ofsted. In both lessons observed at this school the teacher had a low level of intervention. The teacher became much more of a tutor, reviewing assignments and providing feedback on how to improve them.

3. Barriers to self-regulation

Enhanced technologies could create limiting systems that inhibit self-regulated learning rather than enhance it if repetitive and pointless tasks, or through creating barriers to learning that challenge esteem and efficacy beliefs or by providing shortcuts to academic outputs that defeat the objectives of the assignment. The following examples were observed by the field researchers.

3.i Non-selective searching

In a number of lessons field-researchers observed the use of the Internet that did not appear to support, let alone extend the main learning objectives for the lesson. Pupils

were pacified by the opportunity to explore the Internet but their searching was neither structured nor productive.

3.ii Skills barrier

There are some entry-level skills for the use of enhanced technologies and a deficit in these can be a barrier to effective learning. For example, a year five class, working in one of the ICT suites, were continuing their investigations of the Victorians. The teacher focused on sources of evidence, drawing out the distinction between primary and secondary sources. Following an opening question and answer session the teacher engaged the children in a critical analysis of a picture from a web page, talking about what it revealed about Victorian leisure pursuits. Having demonstrated and rehearsed the skills of analysis she required the children to employ, they set about the main task of using two websites to identify and comment on and categorise the leisure activities portrayed there, which they were then to record in prepared in Word tables.

The data search and the ensuing discussions were pertinent and provide a persuasive counter example to those who claim the Internet is being used ineffectively. However, only a small proportion of the children started to record the information acquired from the websites. The teacher identified the children's keyboard skills as a limitation, which made the use of the word processor difficult. In the second class observed in this school, the children recorded in their exercise books rather than on the screen thus negating the need for keyboard skills.

3.iii Filtering

The very real need to control material coming down the broadband link requires filtering either by the broadband provider (commonly the RBC) or by the school. This filtering can inhibit the educational objectives of the lesson. A year ten geography lesson in a specialist science secondary school was observed to start very positively and clearly showed the potential of multimedia learning and demonstrated once again high pupil motivation. The purpose of the lesson was to look at the controversy created by the building of wind farms in National Parks and Areas of Outstanding Natural Beauty. The approach taken was ideal for many other subjects especially where there is some controversy, dispute or debate. Small multimedia clips presented to the whole class using a data projector were to be the initial stimuli to the debate. Unfortunately in this instance the broadband clips were real player and would

not pass through the filtering system of this areas grid for learning The starter activity was impoverished because of this filtering although the children's own research using other web resources went ahead with enthusiasm. It is important to note that the clips were sourced by sites from respected UK organisations such as the BBC.

3.iv Plagiarism

Enhanced technologies provided enhanced opportunities for plagiarism. At one secondary school the Teaching Librarian expressed concerns about students taking material from the WEB without thought. She was aware that students copy and paste and suggested the information does not pass through their heads but only through the mouse. She was aware that some staff were highly literate while others needed support, so she prepared booklets for both staff and students explaining the stages of the process when using the Internet for research ("Best Practice Net Research"). She also created mouse mat guides for use in the library; searches sites for staff that are subject-specific; and she advises on work with the vetted sites.

Conclusions

There is little doubt broadband connectivity has had an impact on the educational process in these UK test schools. Broadband delivers greater efficiency both in terms of the stability and hence reliability of the system and the ability to do things faster. This has the effect of improving confidence of teachers in the technology and increasing the expectations of learners. For the learner it opens up the possibility of a more efficient and effective learning environment but it does not, however, guarantee this positive change. The degree to which beneficial change takes place is predicated not just on the upgrading of the technology but on the students and teacher response to the opportunities arising from those changes. In this discussion we will examine some of the challenges for educators in adapting to broadband and encouraging self-regulated learning. These include the need to challenge assessment techniques and teaching and learning styles, the problems of motivation, the dangers of creating a "digital divide" (BSG 2004) and the potential for educational subversion.

Assessment: In the introduction we posed the question whether broadband was having an effect on educational performance and found that there was conflicting evidence as to the beneficial impacts of the technology. This in part may be due to the mismatch between traditional modes of assessment and the skills that are now being developed through use of the technology (see Wood, Underwood & Avid,

1999). The observations here of classroom activity found learners engaged in a wide range of tasks requiring an equally wide range of skills. The issue is to consider how much of this learning is tested in the assessments. The benefits of self-regulated learning are lost in assessments that do not require the student to show any feature of self-regulation. It might well be a better strategy for students to avoid self-regulation if they are to achieve the highest marks in the assessments It appears that broadband technology provides the opportunity for developing self-regulation skills but the assessment process does not give the opportunity to use these and in fact may discriminate against them.

It is therefore to be expected that research (e.g. Fuchs & Woessmann, 2005) finds little or no improvement in standard measures of achievement as these measures do not test many, if any of the new skills such as working with multiple courses of data (see example 2.iv above). The broadband technology has created a challenge for assessment in the UK and our observations illustrate the extent of this challenge.

Motivation: Pintrich (1999) describes the motivational features for self-regulation of self-efficacy, task value beliefs and mastery goal orientation. Self-efficacy beliefs are difficult to assess but we would argue that comments we noted from students (see for example 2.iii) and the sustained enthusiasm and engagement we observed (1.i, and 2.iv) illustrate the power of broadband to promote self-efficacy. Similarly, we have no direct measure of the task value beliefs of the students but our observations of the respect shown by students (1.ii) and interest (1.iii) gives indirect support to the idea that students value ICT work highly. With regard to mastery goal orientation, Pintrich (2000) divides this feature into approach performance goals (trying to excel) and avoidance learning goals (trying to avoid learning or trying to avoid looking incompetent). Many of our observations noted the enthusiasm of students and the high use of computer facilities out of school hours. The broadband technology allows students to produce better quality homework and at one school (2.v) they had devised a way of restructuring an online science facility to help produce better work in all subjects. The avoidance learning goals were also observed (3.i).

Teaching and learning styles: Self-regulated learning requires a culture shift in styles of teaching and learning. We argue that this culture shift can be facilitated through the imaginative use of broadband technology. The teacher who embeds ICT into the lesson rather than making it an add-on commonly provides a less didactic form of

teaching support (see 2.iii). There are barriers to adopting this style, however, because of the requirements of school inspections in the UK (2.v).

ICT-based project work allows teachers to adopt the style of contingent instruction. The basic ideas of this approach are *"deceptively simple to state, though hard to achieve in practice"* (Wood & Wood, 1999; p.154). The contingent tutor offers help only when a learner is unable to resolve their difficulties. The tutor is able to stand back when the learner shows competence with the material and this allows the learner to take more and more responsibility. At first sight it appears that the contingent help is rather didactic and is expressed in terms of what the tutor does to or for the learner, but Wood and Wood (1999) argue that this is a two-way model, an interaction between tutor and learner and that contingency is an emergent property of that interaction. The growing competence of the learner and their growing sense of responsibility lead to greater self-regulation. The structure of the ICT based lesson provides opportunities for teachers to provide this style of support. We saw evidence of how broadband can facilitate contingent tutoring (2.i, 2.iv)

Digital divide: Nenniger's (2005) suggestion that self-regulation is for the academically able is challenged by the findings here. A number of our observed schools were introducing on-line courses, such as that described in 2.iii, specifically for average or low performing learners. These learners were thriving in the less didactic and more self-regulated learning environment that these courses provide. The lessons described above in 2.iii and 2.iv are all from schools with challenging catchment areas and a record of poor results. In all cases the teachers and managers perceive broadband as a driver for the measurable improvement of their results. For example, in the London primary school with 40 registered languages it was noted that the ICT rich learning environment removed the language hurdle that many children experience in their schoolwork. We would argue that far from hardening the divisions between social groups in education, broadband is leveling the playing field.

Subversion: In the UK, secondary education for many children is a process of resistance and subversion (Corrigan, 1979). Broadband technology appears to attract more respect from learners than other school facilities (1.ii) but it still provides new opportunities for these activities. Some of these activities can have a positive benefit for the learner, so for example, secretly listening to music over the Internet

(2.iv) made the lesson more enjoyable but did not appear to interfere with the work. Also the science learners (2.v) who were subversively using a VLE for educational activities over and above those specified by the website were advancing their studies productively. Not all activities are so positive and some lessons were observed with pointless and repetitive activities (3.i).

The issue of plagiarism has still to be dealt with in UK education at all levels. A recognition of the problems of plagiarism, however, can lead to new and better practice (3.iv) and can generate discussion on the nature of sources and knowledge.

Broadband and self-regulation: Broadband is an enabling technology but not a sufficient technology. It requires other technologies and culture change to bring about changes in our behaviour and to encourage self-regulated learning in our studies. A number of problems with e-learning have been identified (Buller & Selinger, 2005) for example,

- it has tried to replicate the classroom but with a constrained teacher-learner relationship
- there is not enough interaction and collaboration with learners
- delivery is mostly a 'sit-back' rather than 'sit-forward' experience
- there are very low levels of personalisation or demand driven learning

These features of e-learning inhibit self-regulation. The strategic student consumes e-learning but is not necessarily changed by it. Self-regulation is about personal change and personal control rather than knowledge consumption. The proposed solution is to create e-learning that is meaningful, memorable and motivational (Buller & Selinger, 2005) and we argue that best practice in the test schools is providing just this.

E-learning does not have to be a pacifying experience and evidence from the wider community shows the self-regulating potential of broadband. In the UK 46% of broadband users have moved their PC into their daily living space, and these broadband users are participating online in new ways. A survey of 2,500 broadband users found that,

- 57% have created content to post online that they would have created offline
- 59% have posted comments on message boards

- 28% have their own website
- 25% use broadband to organise meetings online, and although many of these are informal and social some are community or sporting events
- 81% email people that they otherwise not keep in touch with (Demos 2004)

It is estimated that there are now 4 million weblogs with 12,000 new ones being added every day. People are changing their patterns of communication and self-presentation. Their use of broadband is allowing them to take more control over their lives and of the way they interact with knowledge. Broadband is promoting self-regulatory behaviour in everyday activities.

The issue for educators is how to move this self-regulatory behaviour into the learning environment. The iSociety argues that the most important part of mastering broadband is having a "wow moment" (Crabtree & Roberts, 2003). 'Wow Moments' are moments of revelation and wonder when a person suddenly sees, for example, a surprising and exciting use of the technology. Despite all the hyperbole surrounding broadband, it is a very mundane if highly functional technology. "Wow moments' come from what can be achieved through the technology rather than a sense of wonder at the technology itself. Our evidence points to broadband technology providing motivation to study and opportunities to self-regulate.

Summary

Broadband provides opportunities for students to develop self-regulation strategies, but these strategies do not necessarily provide any benefit for most national assessments of educational performance. We would argue that assessment strategies have to be revised to take account of the aim to promote skills of self-regulation and to acknowledge the new opportunities offered by broadband technology.

Self-regulation is not the exclusive domain of high performing students and broadband is a means of leveling the educational playing field and including the widest range of students.

Technology is not enough to promote self-regulation and improve performance. A culture change is necessary to bring this about. Broadband / ICT is the vehicle to

bring about this change and to improve learning by enhancing self-regulation in students.

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Paper 6

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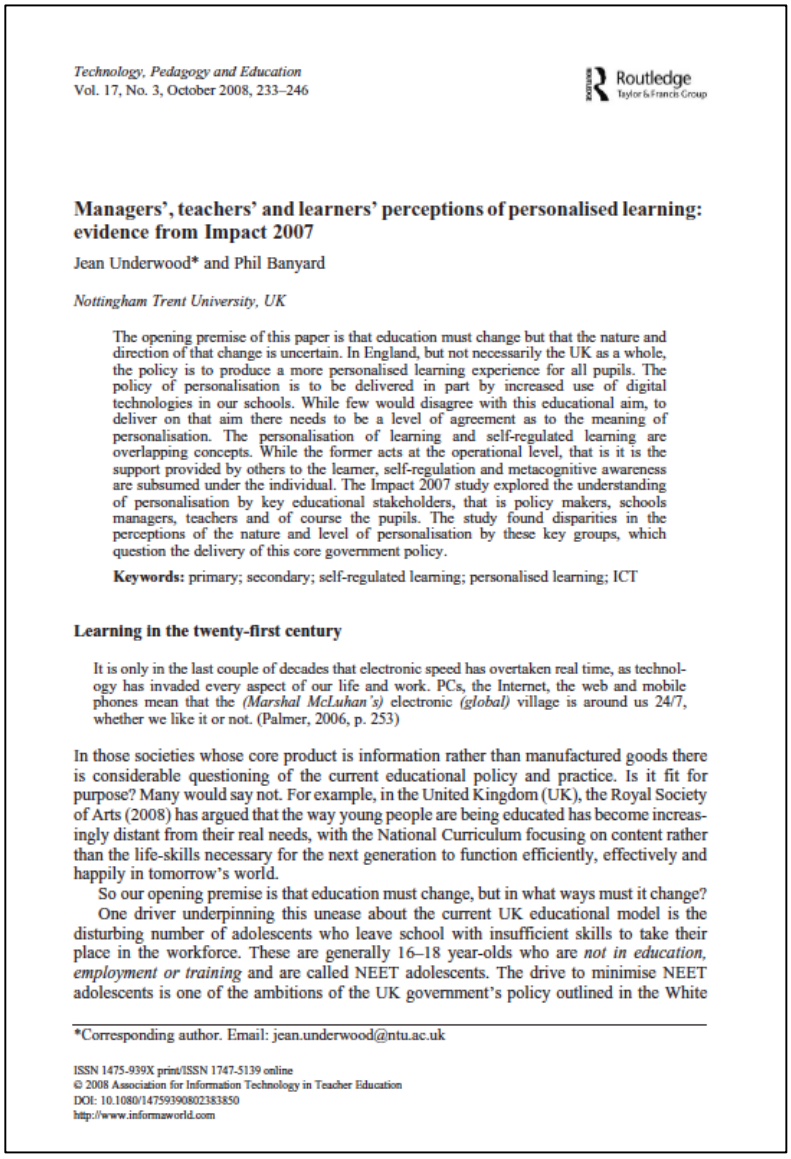

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Managers', teachers' and learners' perceptions of personalised learning: evidence from Impact 2007

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The opening premise of this paper is that education must change but that the nature and direction of that change is uncertain. In England, but not necessarily the UK as a whole, the policy is to produce a more personalised learning experience for all pupils. The policy of personalisation is to be delivered in part by increased use of digital technologies in our schools. While few would disagree with this educational aim, to deliver on that aim there needs to be a level of agreement as to the meaning of personalisation. The personalisation of learning and self-regulated learning are overlapping concepts. While the former acts at the operational level, that is it is the support provided by others to the learner, self-regulation and metacognitive awareness are subsumed under the individual. The Impact 2007 study explored the understanding of personalisation by key educational stakeholders, that is policy makers, schools managers, teachers and of course the pupils. The study found disparities in the perceptions of the nature and level of personalisation by these key groups, which question the delivery of this core government policy.

Keywords: primary; secondary; self-regulated learning; personalised learning; ICT

Learning in the twenty-first century

> It is only in the last couple of decades that electronic speed has overtaken real time, as technology has invaded every aspect of our life and work. PCs, the Internet, the web and mobile phones mean that the *(Marshal McLuhan's)* electronic *(global)* village is around us 24/7, whether we like it or not. (Palmer, 2006, p. 253)

In those societies whose core product is information rather than manufactured goods there is considerable questioning of the current educational policy and practice. Is it fit for purpose? Many would say not. For example, in the United Kingdom (UK), the Royal Society of Arts (2008) has argued that the way young people are being educated has become increasingly distant from their real needs, with the National Curriculum focusing on content rather than the life-skills necessary for the next generation to function efficiently, effectively and happily in tomorrow's world.

So our opening premise is that education must change, but in what ways must it change?

One driver underpinning this unease about the current UK educational model is the disturbing number of adolescents who leave school with insufficient skills to take their place in the workforce. These are generally 16–18 year-olds who are *not in education, employment or training* and are called NEET adolescents. The drive to minimise NEET adolescents is one of the ambitions of the UK government's policy outlined in the White

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Managers', Teachers' and Learners' Perceptions of Personalised Learning: Evidence from Impact 2007.

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Abstract

The opening premise of this paper is that education must change but that the nature and direction of that change is uncertain. In England, but not necessarily the UK as a whole, the policy is to produce a more personalised learning experience for all pupils. The policy of personalisation is to be delivered in part by increased use of digital technologies in our schools. While few would disagree with this educational aim, to deliver on that aim there needs to be a level of agreement on as to the meaning of personalisation. The personalisation of learning and self-regulated learning are overlapping concepts. While the former acts at the operational level, that is it is the support provided by others to the learner, self-regulation and meta-cognitive awareness are subsumed under the individual. The Impact 2007 study[6][7] explored the understanding of personalization by key educational stakeholders, that is policy makers, schools managers, teachers and of course the pupils. The study found disparities in the perceptions of the nature and level of personalisation by these key groups, which question the delivery of this core government policy.

Learning in the 21st century

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[7] Impact 2007 is a **Becta** funded research project.

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So our opening premise is that education must change but in what ways must it change?

One driver underpinning this unease about the current UK educational model is the disturbing number of adolescents who leave school with insufficient skills to take their place in the workforce. These are generally 16-18-year-olds who are *not in education, employment or training* and are called NEET adolescents. The drive to minimize NEET adolescents is one of the ambitions of the UK government's policy outlined in the white paper "Every Child Matters: Change for Children" (DfES, 2004). The policy is an integrated approach to ensure the well-being of children and young people from birth to age 19, and support through the educational system is axiomatic to this initiative. Central to this commitment to change in education is the concept of personalisation of learning. The research presented here monitored the impact of this policy on sixty-seven primary and secondary schools in England.

Educational initiatives are set in a context of societal change. One major societal shift is the rise of digital technologies. Computing and the World Wide Web are permeating people's lives, including all aspects of the learner's life. It is estimated that there are in excess of 27.2 million weblogs and the blogosphere continues to double about every 5.5 months. There are about 75,000 new weblogs created everyday and 1.2 million posts per day on average or 50,000 posts per hour (Sifry, 2006). People are changing patterns of communication and self-presentation, allowing more personal control over their lives and of the way they interact with knowledge (Banyard, Underwood & Twiner, 2006). The current generation of students are able to work with technologies in ways un-thought of by even their elder siblings. The Test Bed project has shown children as young as five years of age working happily with digital cameras and editing photos to produce their own WebPages, while in the secondary sector students are producing home movies and composing and recording music (Underwood, Dillon & Twining, 2006).

Two questions arise from these educational and societal shifts. In what ways do digital technologies shape learning? Are the changes brought about through technological development supportive of, or orthogonal to, the personalisation of learning? These two questions were core to the Impact 2007 project (Underwood *et al.,* 2007) from which the data presented here are drawn.

Personalising of Learning is a Controversial Concept

The interrelationships between personalised learning, meta-cognition and self-regulated learning are discussed at some length in the opening paper of this special issue (Steffens & Underwood, 2008), here our opening position will be to assume that the personalisation of learning and self-regulated learning are overlapping concepts. While the former acts at the operational level in that it is concerned with providing opportunities for the learner, self-regulation and meta-cognitive awareness are subsumed under the individual's ability to take advantage of those opportunities.

However, personalising of learning is a controversial concept. For the Department of Education and Skills (DfES, 2006) personalised learning is the tailoring of education to individual need, interest and aptitude so as to fulfill every young person's potential. This is not just a matter of readjustments to curricula or pedagogic practice, important though these maybe, but requires a shift in the social dynamics and practices of all partners including learners (see Pollard & James, 2004). This conceptualisation of personalised learning is consistent with Vyotsky's cultural-historical theory of learnng; the belief that thinking is influenced primarily by the social environment (Graham, 1987) and individuals raised in different cultural environments will differ both in the content and their ways of thinking (Gredler & Shields, 2008).

Flowing from Vyotsky's cultural-historical theory of learning, personalisation is a desirable state which should be available to all students, giving them a degree of autonomy and ownership of their learning but within the local and national educational framework from which core learning goals emerge. The Gilbert Review of Teaching and Learning by 2020 (2006) argued that there is a need to ensure that personalised learning is a reality in every classroom and the report sets out a vision for how teaching and learning should develop between now and 2020. Thus the personalising agenda is about providing opportunities for the learner which the latter may or may nor avail themselves of as was demonstrated in Impact 2007 research (see Underwood et al., 2007).

While this is seemingly a rather passive view of personalisation, this conceptualisation does not preclude and indeed would encourage, the development of learning environments in which learners can shape their experience working in diverse locations, with diverse groups and cultures while monitoring their own learning. Green et al. (2005) argue that the Gilbert Review vision and the challenges posed by the personalising learning agenda may prove difficult to meet without digital technologies as it will explicitly require "the communication, archiving and multimedia affordances of digital

resources" (Green et al., 2005 p. 5).

This move to greater personalisation of learning is predicated on the assumption that choice is good but more choice is better. This is a powerfully attractive idea, which has always been possible for the few such as Cambridge undergraduates in their one-to one tutorials, but how can it be achieved for the many? It is to digital technologies that many countries have turned. They are seen as an important mechanism that will allow the scaling-up of opportunity to meet the needs of the many.

While the need to identify and evaluate the role of digital technologies in supporting a more personalised learning experience is stimulated by concerns about the performance of current educational system, it is also stimulated by an awareness that many learners today are already creating personalised learning environments for themselves outside school using digital resources. In so doing these learners are redefining what we mean by learning (Underwood et al., 2008). Learners are becoming adept at using the digital toolkit to support both their internal mental space or thinking (Mayer *et al*., 2003) and also the public and external world of tools and artefacts (diSessa, 2001).

In this paper we investigate school managers', teachers' and learners' perception of personalised learning in schools in England. Is there an agreed concept of personalisation or do these key players in the educational system diverge in their views?

The Impact 2007 Study

The Becta funded Impact 2007 project (Underwood et al., 2007) investigated relationships between levels of e-Maturity, personalising learning (p-Learning) and school performance. In this paper we focus on on the diverging perceptions of personalisation as articulated by school leaders, teaching staff and pupils.

Personalisation of Learning: Expert Perceptions

At the start of this project we conducted a literature review and held a seminar of experts (practitioners, policy makers and researchers) from which three levels of personalisation emerged:

Personalisation: A political aspiration

The political aspiration for personalisation is that it will be a strategy for ensuring over time that

- every pupil experiences success appropriate to their age and ability

- all pupils are engaged and excited by learning
- every pupil will have high aspirations for his/her work
- every pupil feels supported in making progress
- pupils know that they are valued
- parents know that their child is valued.

Personalisation: Objectives for education

As applied to schools this will offer learning which:

- reflects the most appropriate ways of learning
- takes account of any past performance or prior learning
- is presented in a way which is engaging and effective for that individual
- encourages learning anytime, anyplace, anywhere
- facilitates more ways to learn
- recognises the learner's short-term needs and longer-term aspirations
- encourages the learner to reflect on and self-regulate their learning
- helps the learner to achieve recognition for their achievements that enables them to progress within the wider community

Personalisation :A set of operational measures

Our experts agreed that personalisation can be observed in schools when they carry out some or all of the following activities:

- Agree targets with pupils
- Help pupils to understand their own learning
- Give pupils appropriate responsibility for their own learning
- Allows the learner voice to be heard
- Relate learning to pupils' out-of-school experience
- Relate learning to contexts unfamiliar to pupils
- Provide 'enrichment' activities beyond the core curriculum
- Give appropriate feedback to pupils to enable them to make learning choices
- Are flexible in the way teachers present the curriculum in order to meet pupils' individual needs
- Get to know their pupils well as individuals
- Offer their pupils pastoral care
- Accommodate pupils' individual learning needs appropriate to their age and ability

Essentially p-Learning for our experts is the tailoring of pedagogy, curriculum and learning support to meet the needs and aspirations of individual learners irrespective of ability, culture or social status in order to nurture the unique talents of every pupil.

Under this definition personalisation is a desirable state that should be available to all students, giving them a degree of autonomy and ownership of their learning but within the local and national educational framework from which core learning goals emerge.

Research sample

Data was collected from schools in two phases. In the first phase we collected data from school managers on the institutional view of personalising learning and e-maturity. We also piloted our survey instruments on teachers and learners for use in the second phase of the data collection. For Phase One, 36 schools from an initial contact list of 133 agreed to take part. The contact list was developed from personal contacts, previous research collaboration and recommendations from Becta (Table 1). Primary classification criteria were age phase (primary: secondary school) and level of e-Maturity (high: low) as defined by the DfES). This measure of e-Maturity is based on level of resource. It proved to have no predictive power and a new measure of e-Maturity, based on both level and use of the resource, was used in subsequent analyses (see Underwood & Dillon, 2004; Underwood et al., 2007 for a fuller description of this metric).

Table 1 about here

In Phase Two we continued to collect data from 29 of the Phase One schools and recruited a further 38 schools (Table 2). Data was collected through online surveys from teachers, learners and managers. Schools with 10 staff or less were asked to submit responses from all staff and schools with more than 10 staff were asked to encourage a sample of teachers to respond. Although pupils at Key Stages 1, 2, 3, and GCSE were the targets for the online surveys pupils contributed across the primary/secondary age range.

Table 2 about here

Personalisation of Learning: Institutional Perceptions

In Phase One we were able to assess the extent to which senior staff within our partner schools ascribed to the description of p-learning that emerged from the experts' seminar. The heads were asked to select which of 26 descriptors best reflected their understanding of p-Learning. The descriptors were based on the work of Sebba et al. (2006).

Figure 1 about here

The majority of senior managers were aware of the government policy of enhancing personalisation and thought that the policy was both educationally worthwhile and achievable within their own institutions. While most heads were working towards embedding personalisation into the fabric of their everyday school activities, there were differences across institutions as to the meaning, level and, to some extent, the need to foreground this concept. The 31% of head teachers who equated the p-Learning agenda with the need to provide individualised support for pupils with special educational needs tended to foreground the agenda. However, many heads saw personalisation as a basic tenet of their educational philosophy that should emerge from good pedagogic practice throughout their school. That is, personalisation was seen as part of the very fabric of education and not an addition.

Whilst policy makers (DfES, 2006) assert individualisation of learning is not the same as p-Learning, this was one of the most frequently chosen key words by head teachers. A second dichotomy arose in that policy makers and our experts saw p-Learning as integral to widening provision, but this was not integral to school senior managers' perceptions of p-Learning either at primary or secondary level. While processes to support individualisation such as better target setting were identified as important, senior staff focused on an overlapping set of descriptors relating to pupil choice, voice and ownership of learning in defining personalisation rather than on the processes to achieve personalisation.

Personalisation of Learning: Teachers' Perceptions

Having established senior managers' understanding of p-learning we turned, in Phase Two, to the class practitioners. Four hundred and twenty-five teachers completed an online questionnaire as part of this study. The questionnaire was designed to capture teachers' perceptions of support for and attitudes ICT use in their school and also the degree to which they were encouraged and had responded to the personalisation of teaching and learning. The questionnaire had seven subscales and responses were via a five point Likert scale, which included both positive and negative anchoring.

Impact 2007 Teacher Questionnaire: Areas of interest and sample questions

- School intranet (the school's internal network)
    - I use the intranet extensively.
- Teachers and teaching
    - ICT has changed the way people teach.
- Learners
    - In this school ICT has a positive effect on student motivation.

- Personalisation in school
    - In my school I am encouraged to agree targets with pupils
- Personalisation and ICT
    - In this school ICT supports a wider range of learning tasks.
- Potentialities
    - ICT is a major driver of quality in the school.
- Outreach
    - ICT has been used to develop closer links with parents and the community.

Eight questionnaires provided incomplete data, which left 417 usable responses, 57.8% from female and 42.2% from male teachers (Table 3). The sample in balance between male and female primary teachers reflects the distribution of the sexes teaching this group nationally. There were no measurable differences in the responses of male and female teachers.

Table 3 about here

Teachers had between 0 and 38 years of service with an average service of 11.9 years (median = 9) and had been in their current school between 0 and 35 years with an average of 7.3 years (median = 5). No relationships were observed between teaching experience and any of the other variables. However, there were several measurable differences between primary and secondary teachers with the largest effects being:

- Primary teachers (mean = 17.4, sd = 2.3) estimated the effect of ICT on learners as being greater ($F=7.4$, df 1,404, $p=0.007$) than their secondary counterparts (mean= 16.6, sd = 2.4).
- Primary teachers (mean=11.9, sd = 2.1) were more positive about the potentialities of ICT in their schools ($F=66.9$, df 1,395, $p<0.001$) than their secondary counterparts (mean=9.8 sd = 2.4).
- Primary teachers (mean=78.2 sd = 8.3) perceived much more personalising of learning in their schools ($F=30.2$, df 1,351, $p<0.001$) than their secondary counterparts (mean=72.7, sd = 8.7).

The correlational analysis showed that teachers who were positive about the ICT resources in their school were also positive about the impact of ICT on teaching ($r=+0.49$, $p<0.001$), the impact on learners ($r=+0.34$, $p<0.001$) and the outreach of ICT from the school ($r=+0.45$, $p<0.001$). The level of ICT resource score also associated strongly with the full personalisation scale ($r=+0.53$, $p<0.001$). In the teachers' perceptions, it is clear that ICT is strongly associated with personalising learning.

Teachers identified their specialism and this was coded to include around 80% of the responses in 9 categories. These categories showed a number of measurable differences on the subscales, the most notable being,

- Perceived levels of personalised learning in the school, where ICT teachers, Sports teachers and Arts teachers reported the highest levels of personalisation while Mathematics teachers reported the lowest ($F=2.9$, df 13,370, $p<0.001$) (See Figure 2).
- Perceived positive impact of ICT on the learner where ICT teachers and Sports teachers perceived the greatest impact and Design and Technology teachers the least ($F=15.8$, df 13,386, $p<0.000$) (See Figure 3).

Insert Figure 2 about here

Insert Figure 3 about here

In summary, while teachers were positive about both the personalisation agenda and the role of ICT in delivering that agenda, there were significant inter-subject differences with Mathematics teachers seeing the least value of the personalisation policy and Design and Technology teachers being unconvinced by the value of ICT.

Personalisation of Learning: Pupils' Perceptions

The study now turned to pupils' perceptions of the degree to which ICT was used in their school and they felt they had some measure of a personalised learning experience. In addition we asked pupils to self-assess their approach to learning including their ability to persevere and their self-efficacy. The questionnaire had eleven subscales and responses were via a five point Likert scale, which included both positive and negative anchoring.

Impact 2007 Primary and Secondary Learner Questionnaire: Areas of interest and sample questions

- Support and Assistance at School
    - The teachers in this school understand me and support me
- Attitudes towards Computers
    - I enjoy doing school work on the computer
- Computer Use
    - How often do you use the school computers in lunchtime or after school?
- Modes of working
    - In lessons I can choose whether I work by myself or in a group

- Personalisation
    - My teacher tells me how well I am doing in my work
- Self-efficacy
    - I expect to do well in school this year.
- Personalised challenge
    - Once I have solved a problem my teacher gives me a harder task.
- Value
    - It is important to me that I do well in school.
- Persistence
    - I always try to understand what the teacher is saying even when it doesn't make sense.
- Disengagement
    - I do not think that what I learn at school will help me with my future dreams.
- Learning goals
    - I prefer to do class work that is familiar to me rather than new work that I have to learn how to do.

Primary Pupils: Over 1200 primary pupils completed or partially completed the on-line forms of which 1056 were usable entries. There was a roughly even sex split across the sample with 507 girls and 533 boys submitting data. Sixteen pupils failed to record their sex. Number of respondents by school year is shown in Table 4.

Table 4 about here

Although perceived personalisation (scale range 0 to 42) reaches a peak in Year 4 (Figure 4), this peak does not reach statistical significance; overall there was a decline in pupils' perceptions of personalisation as they moved through the primary school ($F= 8.9$, df 3,994, $p < .000$). Other scales also show changes over the years but the largest effect is found in personalisation. We speculate whether it is significant that Year 4 is a school year in which national attainment targets are not at the forefront of teachers' and schools' goals thus allowing for more child rather than content-focused teaching.

Figure 4. About here

Perceived personalisation showed a positive relationship to measures of self-efficacy ($r = +0.48$, $p < .001$), the value pupils placed on their learning ($r = +0.52$, $p < .001$) and pupils' persistence in completing any task ($r = +0.48$, $p < .001$). Thus those children

self-reporting key skills of self-regulation, that is the willingness to invest in their own learning and perseverance, also recognised that their schools were delivering on the personalisation agenda. There were no observable sex differences with the one, unsurprising, exception of disengagement where boys (mean=8.0 sd=2.8) showed more disengagement than the girls (mean=7.5 sd=2.6). (F= 8.5, df 1,998, p<0.004).

Secondary Pupils: Over 1900 secondary aged pupils completed or partially completed on-line forms of which 1822 were usable entries. There was a roughly even sex split across the sample with 887 females and 880 males submitting data. Fifty-five pupils failed to record their sex. Number of respondents by school year is shown in Table 5.

Table 5 about here

As for the primary pupil data we observed a change in personalisation scores with school year (Figure 3). The data show that perceived personalisation declines over time in school time (F=3.4, df 6,416, p<0.002).

Figure 5. About here

Again, as for the primary pupils, perceived personalisation was positively related to self efficacy (r = +0.43, p < .001), but also to level of ICT use (r = +0.35, p < .000). There were observable sex differences with males (mean=48.1, sd=10.5) perceiving more personalisation of their learning experience than girls (mean=46.1, sd=10.1). (F=14.0, df 1,1387, p < 0.001). There was confirmation of previous research (e.g. Broos, 2005) in that female pupils reported lower self-efficacy (mean=15.3 sd=3.0) (F=13.0, df 1,1459 p < .001) and less positive attitudes to ICT (mean=12.0 sd=2.2) (F=32.0, df 1,1608 p < .001) than their male peers (mean=15.8, sd=2.9; (mean=12.5 sd=2.1).

The higher proportion of male disengaged pupils found at primary level was not apparent in these secondary schools.

Matching the perceptions of managers, teachers and learners

In collecting the data from the managers, teachers and learners from our primary and secondary schools we were able to investigate how much agreement there was between them on the level of personalised learning in the school. In primary schools we found no agreement between the three groups in their perceptions of personalised learning in the school. The correlations were all weak for measures of p-maturity (the level of

personalised maturity in the school) and also e-maturity and none reached a level of statistical significance (See Table 6a).

Insert Table 6a & b about here

In secondary schools there was a similar lack of any relationship with one interesting exception (See Table 6b). Although managers did not show agreement with teachers nor teachers with learners, there was some agreement between the perceptions of the managers and the learners as to the level of personalisation within these secondary schools ($r = .42$, $p<.01$).

In Summary: The Differing Views of Personalisation

The understanding of the personalisation of learning agenda, a key part of the DfES (now the DCFS) drive to improve education in English schools, varies across key stakeholders. While p-Learning for our experts was essentially the provision of a framework in which pupils can flourish, school managers focused on pupil choice, voice and ownership of learning rather than on the processes to achieve personalisation. In this they were much closer in their thinking to that of their staff than they were to policy makers, although there were variations in perceptions of personalisation between subject specialists.

However, when the perceived personalised learning scores of teachers and learners were compared at a school level there were no observed relationships between the perceptions of teachers and learners in the same school. Pupils tended to strongly see personalisation as individualisation, that is 'What freedoms do I the pupil have?" While teachers and heads expressed the need to recognise pupil voice and autonomy, the main thrust of their support for personalisation was through better record keeping for the teacher and better feedback to the pupil.

At pupil level primary pupils felt they had a personal education compared to their older peers although in both age phases perceptions of levels of personalisation declined across the age range and were particularly low in years in which national tests were undertaken. Secondary male pupils recorded higher levels of personalisation of learning compared to their female classmates. It may well be that boys are fully aware that they receive more teacher attention than their female peers.

At the heart of the agenda for educational change there is a problem for teachers and managers as they try to deliver the UK government's agenda on Harnessing Technology and providing a personalised education for all learners. Personalised learning is perceived

to be a 'good thing' by managers, teachers and learners but they do not have a common understanding of the concept nor an agreement on how it is being delivered in their schools. Added to this is the different perception of personalised learning held by learners. There is no evidence that these three constituent groups are aware of the disparity in their perceptions of personalised learning.

Further, teachers do not have a shared value the personalising of learning; some subject areas are more sympathetic to it than others. Their acceptance of the value of personalisation is predicated on the perceived effectiveness of the approach in delivering key goals such as effective performance by learners in the UK national tests at 7, 11, 14, and 16 years. Our data show that for some schools the most effective way of boosting performance in these restricted tests is to operate a traditional didactic approach to teaching and not to personalise learning even though other valuable educational outcomes may be inhibited in the process.

To resolve these tensions it will be necessary to define clearly what is meant by personalising learning, to be clear on the desired outcomes of education at the various levels and to use a range of outcome measures beyond national tests.

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Table 1: Distribution of Phase One Sample Schools by Level of e-Maturity, Age Phase and Location

Schools	Primary	Secondary	Total
High e-Maturity	9	14	23
Low e-Maturity	8	5	13
Total	17	19	36

Table 2: Distribution of Phase Two Sample Schools by Level of e-Maturity, Age Phase and Location

	Primary		Secondary		Total
	Rural	Urban	Rural	Urban	
High e-Maturity	5 (2 / 3)	10 (8 / 2)	6 (6 / 0)	20 (15 / 5)	41
Low e-Maturity	4 (3 /1)	12 (8 / 4)	4 (3 /1)	6 (5 /1)	26
Total	9	22	10	26	67

Schools providing (Full Data /Partial Data)

Table 3: Sample Teachers by Phase and Sex

	Primary	Secondary	Total
Male	31	149	180
Female	94	151	245
Total	125	300	425

Table 4: Primary Pupils' Respondents by School Years

School Year	Number of Pupils	Percentage of Sample
Year 3	223	21.1%
Year 4	216	20.4%
Year 5	251	23.7%
Year 6	366	34.6%
All years	1056	100%

Table 5: Secondary Pupils' Respondents by School Years

School Year	Number of Pupils	Percentage of Sample
Year 7	226	12.4%
Year 8	748	41.1%
Year 9	272	14.9%
Year 10	509	27.9%
Year 11 to 13	67	3.8%
All years	1822	100%

Table 6a. The relationships between managers', teachers' and learners' perceptions of personalised learning in their Primary School.

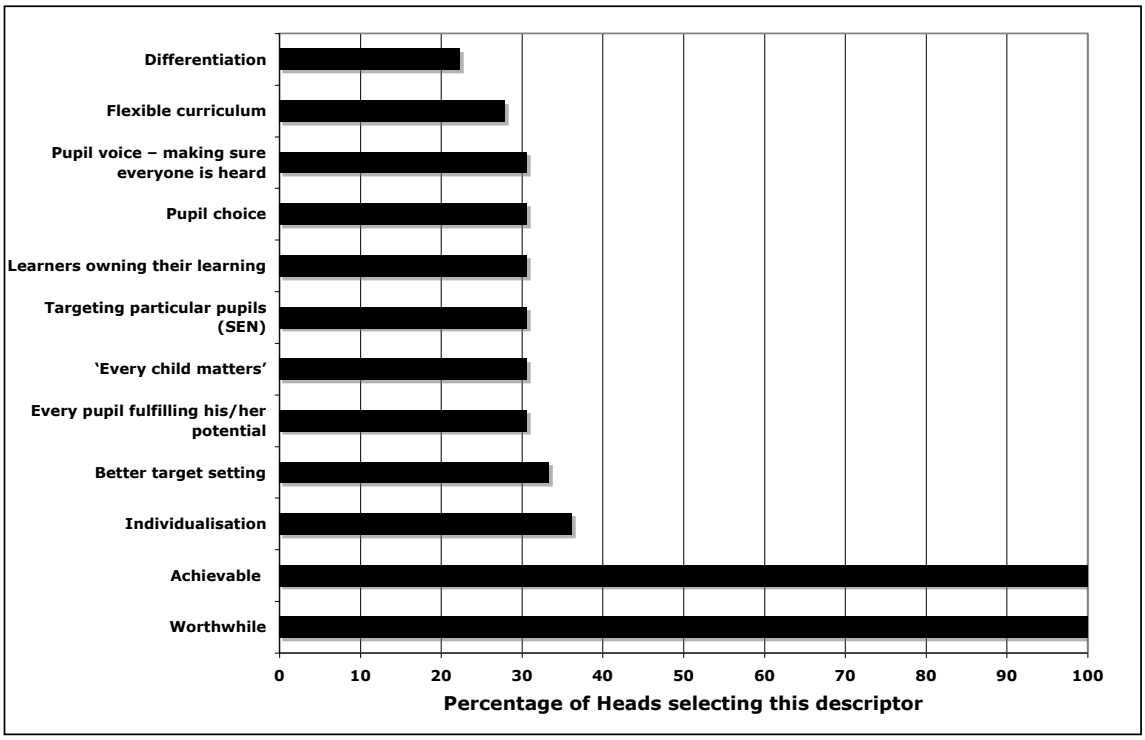
p-maturity (school) v. p-teacher	r = .01	(p = .98, n=23)
p-maturity (school) v. p-learner	r = -.06	(p = .78, n=23)
p-teacher v. p-learner	r = .07	(p=.77, n=23)
e-maturity (school) v. p-teacher	r = .18	(p = .39, n=23)
e-maturity (school) v. p-learner	r = .17	(p = .44, n=23)

Table 6b. The relationships between managers', teachers' and learners' perceptions of personalised learning in their Secondary School.

p-maturity (school) v. p-teacher	r = .19	(p = .36, n=24)
p-maturity (school) v. p-learner	**r = .42***	**(p = .03, n=28)**
p-teacher v. p-learner	r = .08	(p=.70, n=26)
e-maturity (school) v. p-teacher	r = .31	(p = .15, n=24)
e-maturity (school) v. p-learner	r = .09	(p = .66, n=28)

denotes a significant agreement

Figure 1: Head Teachers' Ranked Selection of Descriptor Terms of Personalised Learning



Note: Only descriptors achieving greater than a 20% threshold of response are included here.

Figure 2. Levels of perceived personalisation in school by subject specialism of the teacher.

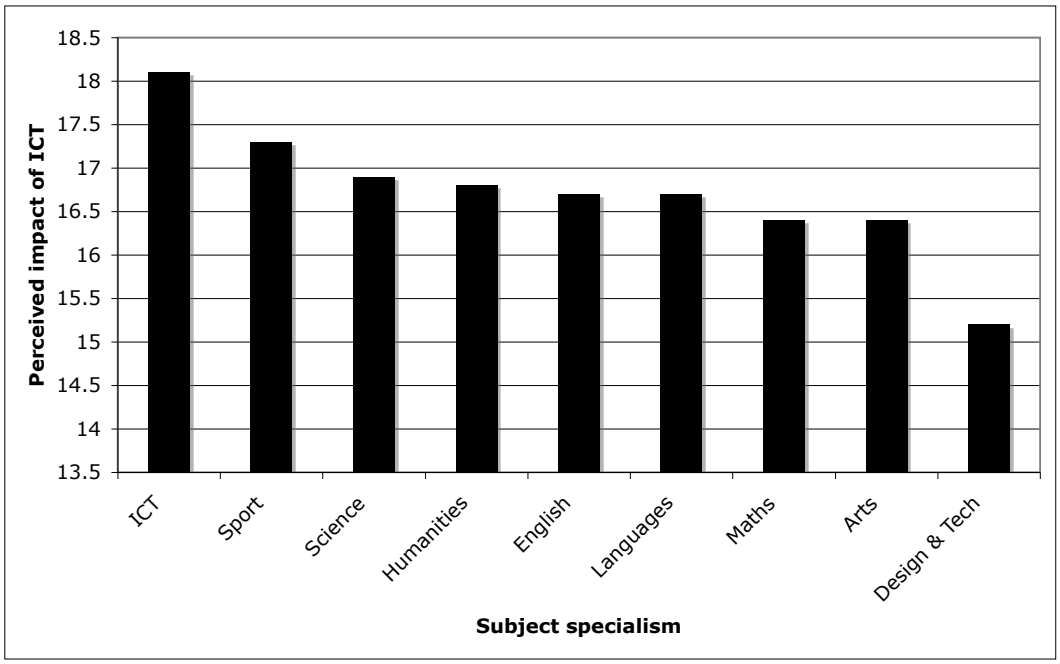


Figure 3. Perceived impact of ICT on learners by subject specialism of teachers

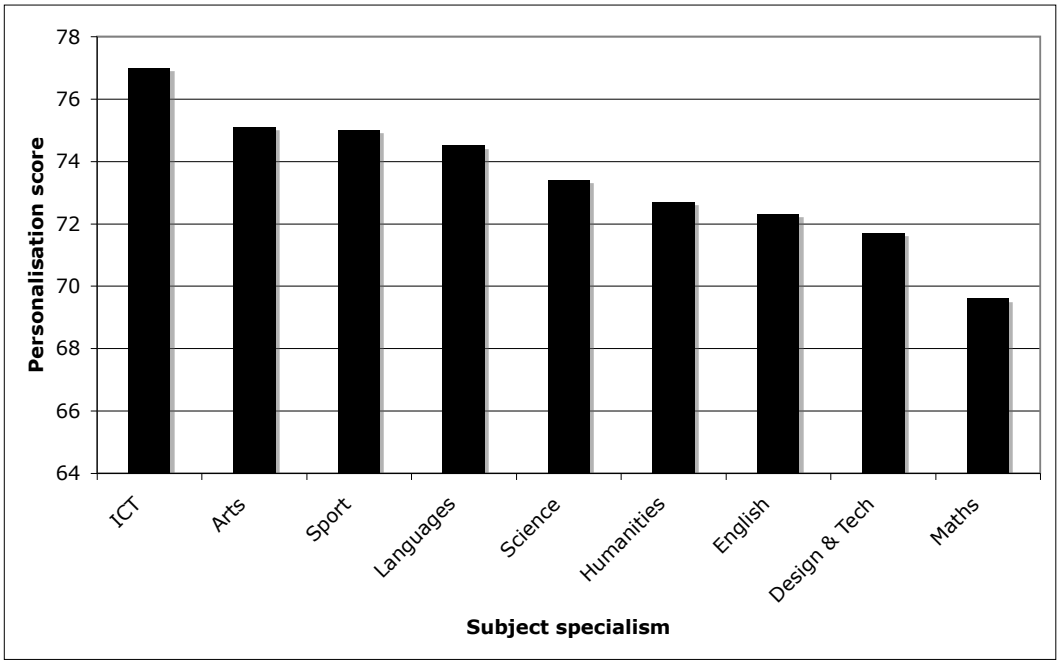


Figure 4. Primary Pupils' Perceptions of Level of Personalisation by School Year

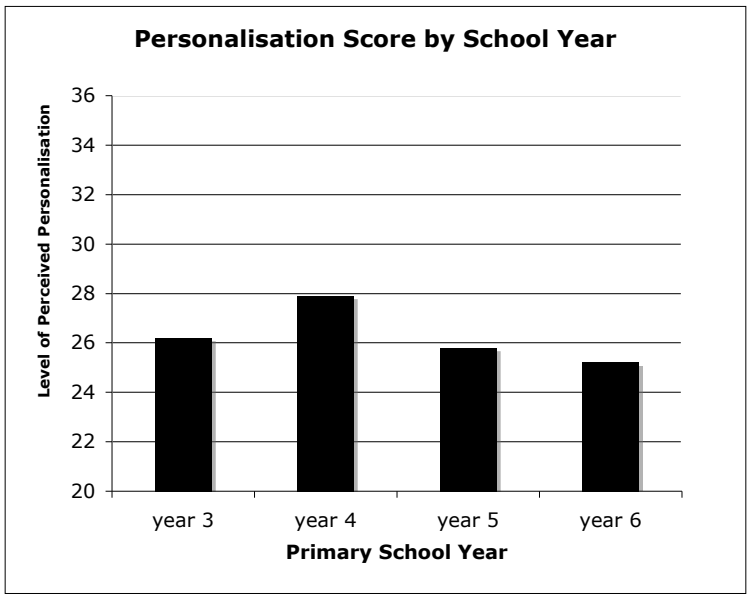
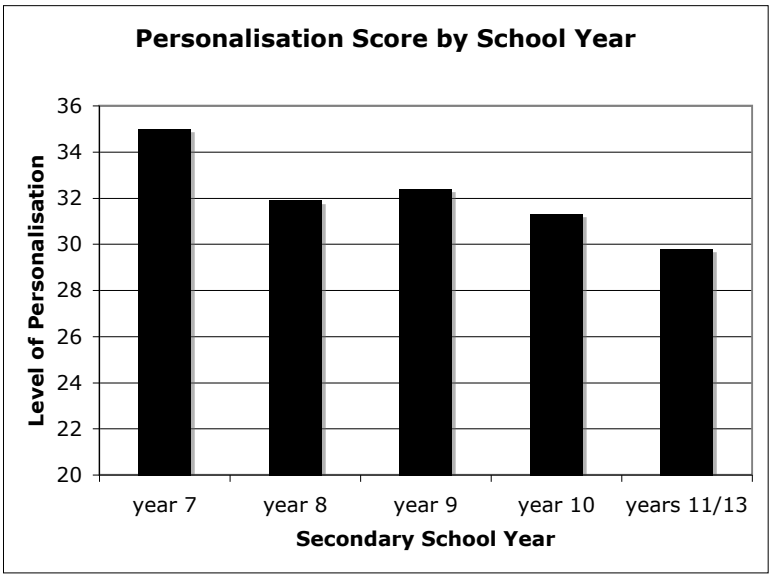


Figure 5. Secondary Pupils' Perceptions of Level of Personalisation by School Year



Paper 7

Banyard, P. & Underwood, J. (2012). E-learning: The dark side? *Elearning Papers, 28*. Retrieved from http://www.openeducationeuropa.eu/en/article/E-learning%3A-The-Dark-Side%3F. (accessed 21.06.14).

(pre-publication version)

In-depth

E-learning: The Dark Side?

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Tags

risk, learning, moral panic, digital citizens, cyber-bullying

There are concerns that the Internet has created new risks for our society and in particular for young people. We argue that the way we frame these risks is affected by the way we view young people, in particular their maturity and ability to make choices for themselves.

A recurrent metaphor concerns the 'dark-side' of the Internet which draws on ancient and modern myths about the nature of good and evil. We argue that a knowledge divide between adults and youth has developed concerning the use of digital technologies. Digital natives are able to change the power balance of our society: this threatens the status quo and therefore has created a moral panic.

The key areas of concern for risk include: cyber-bullying, game-playing, social networking, sexual solicitation and addictive behaviours. Although these areas present real risks, we note that young people are moderating their own behaviour as they develop understandings about the possibilities offered by new technologies. The answer to our concerns should not be to seek to control digital technologies, but rather to educate adults and young people about what is possible and appropriate, so that they can choose to become responsible, digital citizens of the 21st century.

1. Introduction

"There is no dark side of the moon, really. Matter of fact, it's all dark."
Pink Floyd, Dark Side of the Moon

Does the Internet have a dark side? Should we be protecting ourselves and our children from the dangers of the Internet or encouraging them to embrace the opportunity for knowledge and community that it offers? The way we frame our answers to this question is structured by our implicit assumptions about human nature and our understandings about self and society. In this article we will look at these assumptions and review the scientific evidence to see how much we can bring these two sets of understandings together.

One assumption concerns the power of persuasion and hence the ability of individuals to resist influences from powerful others. One view sees the person as passive, malleable and gullible, and the other sees the person as active and capable of making decisions and being discriminating. The volume of books about persuasion on the psychology, business and self-help shelves illustrates our concern and interest in the issue. A second assumption about human behaviour, crucial to our response to the Internet, concerns our view of children and the maturity they are able to show when given the opportunity to do so. This view affects the level of responsibility we allow them to exercise.

These assumptions about human behaviour are only partially framed by the scientific evidence available because they touch our core beliefs about what it means to be human. The 'dark-side' is therefore a useful phrase to explore because it refers to a modern retelling

elearning: the dark side?

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Summary

There are concerns that the Internet has created new risks for our society and in particular for young people. We argue that the way we frame these risks is affected by the way we view young people and in particular their maturity and ability to make choices for themselves.

A recurrent metaphor concerns the 'dark-side' of the Internet which draws on ancient and modern myths about the nature of good and evil. We argue that a knowledge divide between adults and the young has developed concerning the use of digital technologies. The digital natives are able to change the power relationships of our society and this threatens the status quo and therefore has created a moral panic.

The key areas of concern for risk include, cyber-bullying, game-playing, social networking, sexual solicitation and addictive behaviours. Although these areas present real risks we note that young people are moderating their own behaviour as they develop understandings about the facility offered by new technologies. The answer to our concerns is not to seek to control digital technologies but to educate adults and young people about what is possible and appropriate so that we can choose to become responsible, digital citizens of the twenty first century.

Key words: Risk, Learning, Moral panic, Digital native, Cyber-bullying, Privacy

> *"There is no dark side of the moon, really. Matter of fact, it's all dark."*
>
> Pink Floyd, Dark Side of the Moon

Does the Internet have a dark side? Should we be protecting ourselves and our children from the dangers of the Internet or encouraging them to embrace the opportunity for knowledge and community that it offers? The way we frame our answers to this question is structured by our implicit assumptions about human nature and our understandings about self and society. In this article we will look at these assumptions and review the scientific evidence to see how much we can bring these two sets of understandings together.

One assumption concerns the power of persuasion and hence the ability of individuals to resist influences from powerful others. One view sees the person as passive, malleable and gullible, and the other sees the person as active and capable of making decisions and being discriminating. The volume of books about persuasion on the psychology, business and self-help shelves illustrates our concern and interest in the issue. A second assumption about human behaviour, crucial to our response to the Internet, concerns our view of children and the maturity they are able

to show when given the opportunity to do so. This view affects the level of responsibility we allow them to exercise.

These assumptions about human behaviour are only partially framed by the scientific evidence available because they touch our core beliefs about what it means to be human. The 'dark-side' is therefore a useful phrase to explore because it refers to a modern retelling of judeo-christian ideas about people. The 'force' (in the film Star Wars) refers to a universal and metaphysical power that we have access to, but whose strength is so great that it can turn us from good people to bad if we don't use it wisely. Use it unwisely and you will go to the 'dark side' and become consumed by your own darkness such as addiction or a lust for power. This central story of good and evil about how we see ourselves and our society has a profound effect on the general response to the Internet.

Perceived risks

We live in an increasingly risk averse society, and this is particularly true in relation to the protection of children. The different focus that schools adopt to safety concerns about the Internet was illustrated by two neighbouring primary schools that we visited in 2006 as part of a research project for the UK government (Underwood et al., 2007). Situated in rural East Anglia with similar catchments, demographics and rated as above average on national criteria, each viewed the computers in their schools in very different ways. Our contemporaneous observations which we report here are in stark contrast. The first school was on the 'opportunity' end of the spectrum,

> *"The school is delightfully unaware of technical details and only showed a passing recognition of the local broadband consortium (e2bn) who probably provide their broadband link. […]*
>
> *The school believes that most children have access to computers at home and many have access to the Internet. Access at school is largely in lesson time though pupils are allowed to use the unlocked ICT suite in break-times with permission. The school could not name who carried out the blocking of unwanted Internet sites. It was presumed to be the LEA [Local Education Authority]. The school had not experienced any major problems with the Internet though it was accepted that unwanted material would occasionally slip through the filters, for example a search for material on waterfalls elicited some mildly erotic images. The policy of the school is to encourage children to respond responsibly to such material and to delete and report it. There has been no need to take any further action so far."*

The second school was on the 'danger' end of the spectrum

> *"The classroom computers and the mini-suite were not being used on the day of the visit because the ICT coordinator had just found some unwanted material on one of the machines and was waiting for [the Local Education Authority] to send someone to check it out. The school is assiduous in its attempts to keep unwanted material away from the pupils and to make sure that they do not inadvertently come across an offensive site." (unpublished research notes)*

The contrast between teaching children to click-away from inappropriate material and training all staff to monitor children and close down the system if there are any concerns could not be more marked. This was not a unique observation and we

recorded similar contrasting approaches in neighbouring schools in other parts of the UK. The different approaches, we argue, have less to do with understandings about the Internet than with assumptions about human behaviour.

What are the risks?

We will look at some of the risks that have been identified to be associated with the use of internet and then consider whether these represent new challenges for educators or whether they are new expressions of old risks.

i. Cyber-bullying

Online aggression is a very real danger. In a study of 501 regular Internet users (aged 10–17 years), 19% were involved in online aggression, 3% were aggressor/ targets, 4% targets only, and 12% online aggressors only. Aggressor/targets reported characteristics similar to off-line bully/ victims. Furthermore, cyberbullying rapidly transfers to real life, leaving children with no place to hide and teachers with an undercurrent of activity they have no control over (Ybarra & Mitchell, 2004). There are clear sex differences in the acceptance of risk and in cyberbullying, with young males being greater both greater risk takers and more involved in cyberbullying (Dehue et al., 2008).

The question to consider is whether this represents a new and substantial hazard for children or whether it is a different expression of the social negotiation that is part of every child's development. Furthermore we have to consider whether regulation by adults is the best strategy as in involves the invasion of the private worlds of young people, and whether leaving space for the development of social skills in these young people will provide greater long-term benefit.

ii. Game playing

As the developing child acquires social norms about acceptable behavior from his or her experiences, any activity that promotes violence is likely to be a risk factor for violent behavior. The repetitive playing of violent games has been reported as leading to more aggressive behaviour and the desensitisation of the individual demonstrating by decreased brain activity when shown scenes of real violence· (Bartholew, et al., 2006). Meta-analyses, combining data from hundreds of individual studies, confirm an association between exposure to violence in media and antisocial tendencies such as aggression (Huesmann, 2009). Although Ferguson (2010) asserts that much of the research on the link between gaming and aggression is inconsistent and hampered by poor methodologies and the intrusion of ideology and dogma.

The risks associated with less violent video games, particularly those marketed to young children are not well understood, but recent research has shown experimental evidence that video games may displace after-school activities that have educational value and may interfere with the development of reading and writing skills in some children (Weis & Ceranksoky, 2010). It is worth reflecting, however, whether previous generations of children have also turned away from educational activities to play football or tiddlywinks or French skipping.

iii. Unwelcome sexual solicitation

It is difficult to collect reliable data on sexual solicitation via the Internet. One large-scale study in the USA (Finkelhor, Mitchell and Wolak, 2000) carried out interviews with a sample of 1,501 youths aged 10 to 17 years who use the Internet regularly (at

least once a month for the past 6 months). They reported that 19 per cent of their sample received an unwanted sexual solicitation or approach over the Internet in the previous year. The definition was extremely broad and included someone trying to get them to unwillingly talk about sex; asking unwanted intimate questions; requests to do sexual things they did not want to do; and invitations to run away. In addition, 3 per cent (one in seven of all the solicitations) included an attempt to contact the youth via telephone/postal mail and/or in person so the vast majority were associated with the Internet. However, the survey found few sexually orientated relationships between young people and adults. This last point appears to support the idea that children are able to insulate themselves from the more serious hazards.

iv. Social networking

Do people behave different when communicating online to how they do in face-to-face situations? Online interactions have been found to generate more self-disclosure and foster deeper personal questionings than face-to-face communication (Tidwell & Walther, 2002). Underwood, et al. (2011) identified 3 types of Facebook users in young people. One group, the broadcasters exhibited worrying high risk behaviour which tended to focus on one-to-many low quality communications, in which self–promotion and lying were clearly evident. Could it be that social networking facilities encourage risky behaviour in vulnerable young people and open them up to the possibilities of dangerous relationships and encounters? Another feature of social networking is the ability to know ever more details about your partner including their changing moods (status on Facebook), where they are (Find my iphone) and who they are with. It is perhaps no surprise that heavy Facebook use is associated with increased levels of jealousy (Muise, et al., 2009).

Use of social networking sites has been associated with greater levels of social capital, or benefits made possible by the existence of a social structure. For example, Ellison et al. (2007) have show that students who are active on Facebook feel higher levels of both forms of social capital, and the effects are greater for students with lower self-esteem. However, the perceived benefits may depend on the nature of the interactions. A survey of 1,193 students found users who engaged in directed interaction with others, such as leaving wall posts or messaging friends, reported lowered feelings of loneliness and increased feelings of social capital. On the other hand, students who engaged in passive viewing of others' content, such as status updates and photos reported feelings of increased loneliness and reduced social capital (Burke, Marlow & Lento, 2010).

v. Addictive behaviour

Addiction is a perceived danger of Internet use that is fuelled by parental concerns about the amount of time their children appear to spend online. Recent surveys suggest that about 2% of youth can be described as having Internet addiction with 10%–20% engaging in at-risk Internet use (Johansson & Götestam, 2004; Cao & Su, 2007, Christakis et al., 2011). There is some evidence that adolescents and college students that are heavy users of the internet have lower self-esteem and are more socially disinhibited (Niemz, et al., 2005), but a recent review of the area (Widyanto & Griffiths, 2009) concluded that if internet addiction does indeed exist, it only affects a relatively small proportion of the population and there is very little evidence that it is problematic among adolescents.

Digital natives and moral panics

There are perhaps two features of the digital world that enhance the fears of the general population. In the first instance it belongs to the young. Yes, we all use digital technologies but the learning environment has been transformed by them and as Prensky (2001) notes today's young people "are no longer the people our educational system was designed to teach" (page 1). They "are all 'native speakers' of the digital language of computers, video games and the Internet" (page 1). In our research on the impact of digital technologies in schools (Underwood, et al., 2007) we observed a class of 27 four and five year old children log on to their laptops and develop new versions of the song 'Twinkle, twinkle little star' for a full hour despite having very limited reading and writing skills. For example it was noted at the time,

> *"During a demonstration to the whole class, the teacher had difficulty in making the programme work. She was able to problem-solve in front of the class and finally demonstrate how to move the words around on screen and put them into cells in the on-screen grid. This did not trouble either the teacher or the children. The solution was to move the cursor over the cell and then press SHIFT and LEFT CLICK at the same time to select it. This was initially taxing for the children when they returned to their laptops but some of them picked it up very quickly and were soon confidently putting text into the various cells." (unpublished research notes).*

These digital natives have a different experience of dealing with information and technology to previous generations. Technology use is associated both with transient changes in arousal/mood and with long-term changes in behavior/brain function. Prensky (2001) goes on to suggest that this change is having an effect on brain structure but whether this is the case or not, it is clear that young people bring a different skill set to school and to life in general.

The second feature that enhances fears about the digital technologies comes from this association of the changes in technology with the age-group who are the principle users. Adolescence is a period of rapid increases in physical and mental capabilities. Yet, despite having the cognitive ability to understand risk, mortality rates increase by over 200% in this dangerous age (Dahl, 2004) because it is also strongly associated with risk-taking, sensation seeking and reckless behaviour. All of which can have life-changing consequences for the individual. While adolescents are good at assessing risk under conditions of low arousal and cool emotions, under intense emotional arousal they can fail to make a responsible choice.

The fear about young people and their behaviour has been a recurrent theme. Sociologists observe the moral panic (Cohen, 2002) that is created when people fear a threat to the social order. The term was originally used to describe the reaction to youth culture as it developed mid-way through the twentieth century as young people became independent consumers in the new age of prosperity. In today's world it is digital technologies that present a clear and present danger to the social order and the demonisation of the Internet is a response to that threat.

The digital technologies represent a threat to the social order because they create a shift in power. There is a loss of adult power over children because much of the digital word is a mystery to parents. There is also the democratisation of knowledge that the Internet offers through facilities such as Twitter. Governments, even repressive governments, are no longer able to control the flow of information. The loss of power from people and organisations who are used to exerting it creates

uncertainty and fear.

What's to be done?

To reiterate, we live in a risk averse society and so one of the first responses to a threat is to restrict access to digital technologies and to try and control them. The metaphor we would suggest here, however, is of the outdoor world. Mountains are very good to look at but can be dangerous if you climb up them. People sometimes get lost on them and occasionally fall off them. There is no suggestion that we should fence them off and protect people from themselves, rather we urge walkers to have the right kit and to develop relevant skills such as the ability to read maps. However, with the Internet we consider this a possibility because of the moral panic that has been generated to demonise it.

If we consider again the risks associated with the Internet that we looked at above, then we must ask to what extent these risks are exclusive to the Internet, and how great the risk really is. We must also ask who is at risk. The youngest children have low exposure, but risk rises as children approach adolescence. As Ferguson (2010) remarks we are at risk that concerns about technology use could move beyond objective examination and into the realm of ideology, dogma and moral panic

One aspect of the moral panic concerns the impact of video from television and YouTube. Newspaper reports suggest that over ten hours of video is posted on YouTube every minute and the 20 million daily viewers in the UK watch more than 3.6 billion videos online every month (Johnson, 2008). The fear is that we have created a cult of the amateur where what we see on YouTube is given equal weight to the considered evaluation of journalists. If we all become amateur journalists and critics then there are no experts, and the prevailing view is formed by the loudest and most opinionated (Keen, 2007).

A counter view comes from the report on the Video Republic by the UK think-tank Demos (Hannon et al, 2008). They note the problems with the rise of video culture but comment that it offers hope for new forms of democratic expression and participation. They provide many recommendations for how we can embrace the technology and better prepare our young people for work and for life. For example they recommend

> *"Schools, universities and businesses should prepare young people for an era where CVs may well be obsolete, enabling them to manage their online reputation. They should pass on guidance from recruitment agencies and other experts to help them make informed decisions about what they put online and contribute to the Video Republic." (page 66)*

The Demos report also uses the ubiquitous 'dark-side' rhetoric but they come up with a solution to the fear of harmful and objectionable material.

> *"Currently the tools we have to distinguish between harmful content are too blunt: content is either deemed 'inappropriate' or is for over-18s only. People should have the ability to select age-rating systems for videos on websites. The average of these ratings could then be translated into a region's film-rating classification system." (page 70)*

In other words, use the facility developed by TripAdvisor and Amazon and other consumer sites to allow users to post evaluations and view the evaluations of others. The expert judge is replaced by the collective expertise of the users. Although there

are concerns about the ability of the crowd to make good decisions (Keen, 2007) it is part of the modern democratisation of knowledge that allows us to comment on things and events and see the comments of others.

Are Internet dangers different to real-life dangers?

Many hazards and associated risks offline are relatively well known and understood but we have yet to fully explore whether online hazards and risks are essentially the same or, in some important ways, different from those in the non-virtual world. However, one area where there appears to be a difference in the level and quality of risk between off and online worlds is the area of cyberbullying. Bullying is a phenomena in all walks of life but technology brings a new dimension to this problem in that the victims of bullying feel unable to escape and the perpetrators feel invulnerable due to anonymity.

Recent data from the UK suggests that 19% of children between the ages of 9 and 19 say that have been bullied in the last 12 months. Interestingly for this debate when you break down that figure you find that 13% of those instances were face to face, 3% were via mobile phones and only 6% were via the Internet (Livingstone et al., 2011). The report, which included data from countries across Europe goes on to note that “Bullying online appears more common in countries where bullying in general is more common (rather than, say, in countries where the Internet is more established).” (page 62)

The evidence for the other areas we suggested above, addictive behaviours, game playing, social networking and unwelcome sexual solicitation is much less clear. These are all issues for off-line behaviour and so our focus on the potential damage created by the Internet means we are focusing on the medium and not the real problem. If we return to the ‘dark-side’ metaphor then just as with these myths, the dark side is not out there but inside people. And this brings us back to the assumptions we hold about people, their ability to deal with persuasion and the responsibility they have for their actions. Do we see people as passive, malleable and gullible, or as active, discriminating and capable of making intelligent decisions?

Dealing with risk

We argue in this paper that the Internet does not pose a special threat in and of itself. It is not the dark side but is another stage on which people display the full range of social and inter-personal behavior. As such it is also the stage where some negative and distressing behaviours can occur. The issue we argue is about identifying who is particularly vulnerable to these risks and how we can provide some structure that limits the extremes of negative behavior.

The first challenge is for adults to be aware of what happens on the Internet and to offer the same guidance for interactions online that they would offer for face to face interactions. Parents appear to be overconfident, for example, about the extent of bullying. Among the 3% of European children who reported that they had been bullied on the Internet, less than a third of their parents (29%) were aware of this with over half asserting that their child had not been bullied (Livingstone et al., 2011).

As noted above, the Internet belongs to the young and parents and teachers are only partially aware of what children are doing. This lack of knowledge can create a sense of threat in those who are aware of their lack of knowledge. It is worth noting however that a detailed analysis of the 3% of children who were bullied online found that over 90% reported that they were not bothered by the event after a few days (Livingstone

et al., 2011). They were commonly able to do something about it by, for example, blocking the person who sent the message. So the threat is out there, but it is much less than the face-to-face threat and children are commonly able to find ways of dealing with it.

Further evidence on the different approaches of parents and children comes from the ongoing Ofcom Media Literacy Studies in the UK (Ofcom, 2011). In the most recent study they find that parents are more likely to be concerned about the television content their child watches (31%) compared to Internet content (23%). The issue to consider is whether the reduced concern about Internet use is justified. The responses of the children to the survey suggest that there are, indeed, reasons to be cheerful. For example, close to half of 12-15 year olds who use search engines make critical judgements about the results concerning the truthfulness of sites. Also when asked about their attitude towards sharing personal information online, the majority of children in this age range said they would either want nobody or only friends to see their information (Ofcom 2011).

The second challenge is to help young people to understand the risks related to the Internet. That such an understanding is developing is shown by a set of studies on student use of social networking sites. In 2005 Gross and Acquisti (2005) surveyed 4,000 student Facebook users and found a disturbing degree of naivety about personal information. These students openly provided sensitive data: over 50% broadcast their address and very few used the privacy settings. By 2007 Fogel and Nehmad (2009) found only 10% of students were openly distributing their personal address. Use of the privacy settings is also increasing. In 2007 Lewis, Kaufman and Christakis (2008) found that a third of students had private profiles of which less than 10% allowed some level of restricted searching, while Dey, Jelveh and Ross (2012) report that in 2010 less than 20% of their 1,700 users hid their friend lists but that this had increased to over half using this form of self-protection some 15 months later. This move away from the default privacy settings to more restrictive settings is evidence of increasing awareness of privacy and security issues had increased. Our young can and do learn. We need to provide convincing evidence for them to so.

In Summary

We argue here that it is important for teachers and parents to make themselves more familiar with the Internet and hence of the potential risks. Currently in the UK half of parents with children aged 5-15 who use the Internet believe that they know less about the Internet than their children (Ofcom, 2011). It is clear that parents are becoming more aware of the risk and the 2011 Ofcom survey showed an increase in homes using passwords on their multichannel televisions (36% to 44%) but no change in the use of parental controls on Internet use (steady at 39%). Simple controls and observations of behavior can manage the majority of risks.

We argue here that the most effective way to manage risk on the Internet is to help the young to gain an understanding of the risks related to the Interent and then trust in the maturity of young people, and trust in their overall judgement and social skills to negotiate these news ways of relating and behaving. Apgar (2006) coined the term risk intelligence, that is the capacity to learn about risk from experience. We need to expose the young to risk in safe environments such as schools so that they become risk intelligent. In this way they can be guided to become responsible, digital citizens of the twenty first century.

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Paper 8

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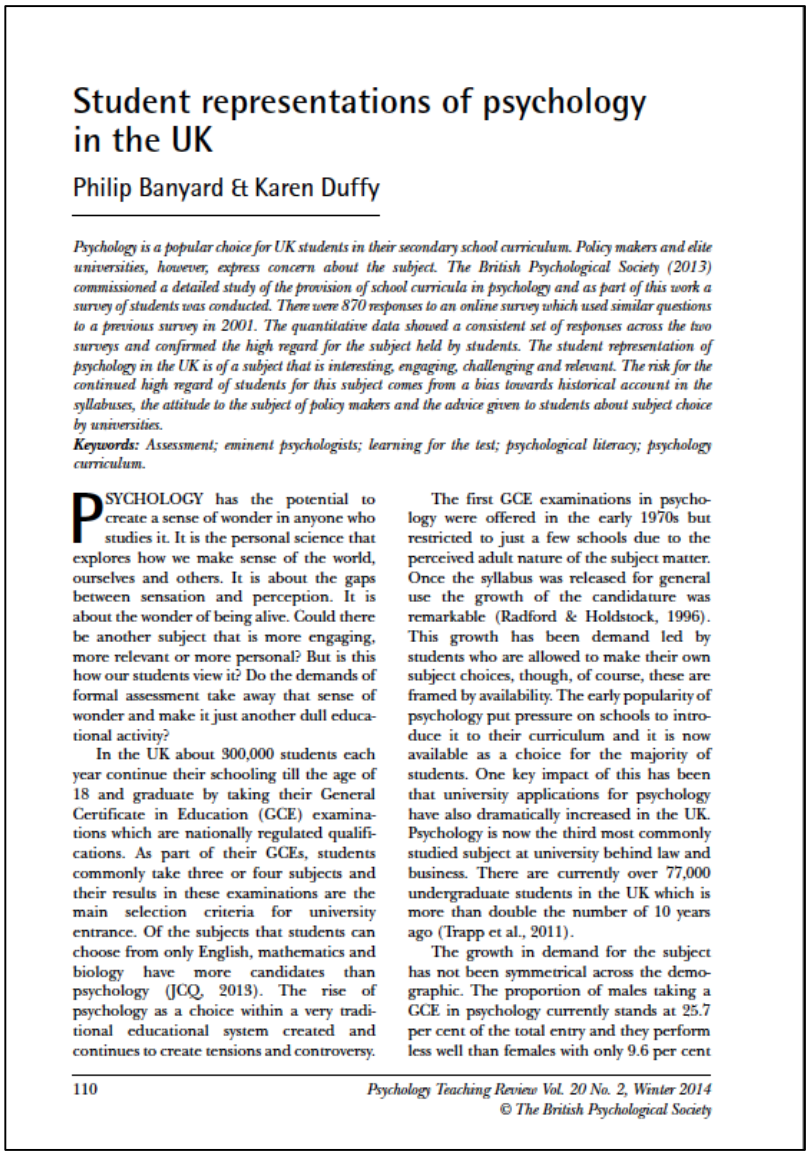

Student representations of psychology in the UK

Philip Banyard & Karen Duffy

Psychology is a popular choice for UK students in their secondary school curriculum. Policy makers and elite universities, however, express concern about the subject. The British Psychological Society (2013) commissioned a detailed study of the provision of school curricula in psychology and as part of this work a survey of students was conducted. There were 870 responses to an online survey which used similar questions to a previous survey in 2001. The quantitative data showed a consistent set of responses across the two surveys and confirmed the high regard for the subject held by students. The student representation of psychology in the UK is of a subject that is interesting, engaging, challenging and relevant. The risk for the continued high regard of students for this subject comes from a bias towards historical account in the syllabuses, the attitude to the subject of policy makers and the advice given to students about subject choice by universities.

Keywords: *Assessment; eminent psychologists; learning for the test; psychological literacy; psychology curriculum.*

PSYCHOLOGY has the potential to create a sense of wonder in anyone who studies it. It is the personal science that explores how we make sense of the world, ourselves and others. It is about the gaps between sensation and perception. It is about the wonder of being alive. Could there be another subject that is more engaging, more relevant or more personal? But is this how our students view it? Do the demands of formal assessment take away that sense of wonder and make it just another dull educational activity?

In the UK about 300,000 students each year continue their schooling till the age of 18 and graduate by taking their General Certificate in Education (GCE) examinations which are nationally regulated qualifications. As part of their GCEs, students commonly take three or four subjects and their results in these examinations are the main selection criteria for university entrance. Of the subjects that students can choose from only English, mathematics and biology have more candidates than psychology (JCQ, 2013). The rise of psychology as a choice within a very traditional educational system created and continues to create tensions and controversy.

The first GCE examinations in psychology were offered in the early 1970s but restricted to just a few schools due to the perceived adult nature of the subject matter. Once the syllabus was released for general use the growth of the candidature was remarkable (Radford & Holdstock, 1996). This growth has been demand led by students who are allowed to make their own subject choices, though, of course, these are framed by availability. The early popularity of psychology put pressure on schools to introduce it to their curriculum and it is now available as a choice for the majority of students. One key impact of this has been that university applications for psychology have also dramatically increased in the UK. Psychology is now the third most commonly studied subject at university behind law and business. There are currently over 77,000 undergraduate students in the UK which is more than double the number of 10 years ago (Trapp et al., 2011).

The growth in demand for the subject has not been symmetrical across the demographic. The proportion of males taking a GCE in psychology currently stands at 25.7 per cent of the total entry and they perform less well than females with only 9.6 per cent

Student representations of psychology in the UK

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Abstract

Psychology is a popular choice for UK students in their secondary school curriculum. Policy makers and elite universities, however, express concern about the subject. The British Psychological Society (2013) commissioned a detailed study of the provision of school curricula in psychology and as part of this work a survey of students was conducted. There were 870 responses to an online survey which used similar questions to a previous survey in 2001. The quantitative data showed a consistent set of responses across the two surveys and confirmed the high regard for the subject held by students. The student representation of psychology in the UK is of a subject that is interesting, engaging, challenging and relevant. The risk for the continued high regard of students for this subject comes from a bias towards historical account in the syllabuses, the attitude to the subject of policy makers and the advice given to students about subject choice by universities.

Key words

assessment, eminent psychologists, learning for the test, psychological literacy, psychology curriculum.

Student representations of psychology in the UK

Introduction

Psychology has the potential to create a sense of wonder in anyone who studies it. It is the personal science that explores how we make sense of the world, ourselves and others. It is about the gaps between sensation and perception. It is about the wonder of being alive. Could there be another subject that is more engaging, more relevant or more personal? But is this how our students view it? Do the demands of formal assessment take away that sense of wonder and make it just another dull educational activity?

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The first GCE examinations in psychology were offered in the early 1970s but restricted to just a few schools due to the perceived adult nature of the subject matter. Once the syllabus was released for general use the growth of the candidature was remarkable (Radford & Holdstock, 1996). This growth has been demand led by students who are allowed to make their own subject choices, though of course these are framed by availability. The early popularity of psychology put pressure on schools to introduce it to their curriculum and it is now available as a choice for the majority of students. One key impact of this has been that university applications for psychology have also dramatically increased in the UK. Psychology is now the third most commonly studied subject at university behind law and business. There are currently over 77,000 undergraduate students in the UK which is more than double the number of ten years ago (Trapp et al., 2011).

The growth in demand for the subject has not been symmetrical across the demographic. The proportion of males taking a GCE in psychology currently stands at 25.7% of the total entry and they perform less well than females with only 9.6% obtaining a grade A or A* compared with 19.5% of females (JCQ, 2013). The genderization of psychology in the UK has attracted a lot of speculation (for example Radford & Holdstock, 1995; Sanders et al., 2009) but it is not fully understood.

The growth in demand for GCE psychology has not always been positively received and there have been frequent comments in the press claiming that it is an easy option (Jarvis, 2011). For example, John Dunford, the general secretary of the Secondary Heads Association, claimed to BBC news that children were choosing subjects they thought were easier and he identified psychology as one of these subjects (BBC, 2003). The British Psychological Society (BPS) made a strong rebuttal of the claims (Morris, 2003) but the view of psychology as a non-traditional and hence less valid subject remains. The elite universities in the UK are known as the Russell Group and there is concern that the negative view of GCE Psychology view informs the selection process of these universities (Daily Telegraph, 2011; Russell Group, 2011). The Russell Group have identified a core group of A-Level

which they refer to as facilitating subjects and which they advise students to take if they wish to keep their degree options open if they wish to apply to Russell Group universities (Russell Group, 2011). Psychology does not feature as a facilitating subject and there is pressure on schools to move students away from Psychology now that a further league table has been introduced by the UK government that records performance on these facilitating subjects.

It is possible to make a robust rebuttal of the suggestions that psychology is an easy option. Evidence about the relative difficulty in achieving good results in particular subjects is systematically collected and commonly shows that psychology is at least as taxing as other equivalent subjects. For example, a comparability study by the Qualifications and Curriculum Authority (QCA, 2008) using expert judgements found that the assessment of psychology and biology at GCE were of equivalent difficulty. Using a different method the Curriculum Evaluation & Management (CEM) Centre at Durham University monitors relative achievements in different A-levels. Using performance from previous national examinations as an indicator of ability, analyses are carried out to compare the average performance at these assessments for those students achieving a pass at GCE. This analysis places psychology around the middle of ranked subjects (Coe, et al 2008).

Psychological literacy

One consequence of the growth in psychology courses at all levels is the increasing proportion of the population of the UK who have taken a programme of study in the subject. It is estimated that for the last 15 years over 13% of each cohort of 18 year olds have taken a qualification in the psychology (BPS, 2013) and if you add in the number taking psychology as part of their courses in health and social care for example then a picture develops of a population with a growing awareness of the basic ideas of psychology. For many students this is the only psychology course they study so these school-based courses are in a position to have a profound effect on the nation's understanding of psychological concepts.

The term 'psychological literacy' was first used by Boneau (1990) in a study to identify key concepts in psychology. Subsequently McGovern et al (2010) used the term 'psychologically literate citizens' to refer to the outcome of a degree in psychology that results in students becoming *"critically scientific thinkers and ethical and socially responsible participants in their communities"* (page 10). It is clear that in the UK the most common qualifications that students finish their studies in psychology with are schools based such as the GCE. The psychological literacy of the UK will therefore be defined by these courses.

Assessment

One of the challenges for teachers striving to create interesting and challenging courses is the style of formal assessment for the GCE. Many GCE assessments are still conducted using traditional (i.e. pre-digital technologies) techniques, and focus on traditional academic skills. The origin of these techniques in UK education can be traced back through the University of Cambridge Local Examinations Syndicate (UCLES) to 1858 when a group of academics were invited by some Durham schools to develop assessment techniques for their pupils. The lessons were observed in order to capture how the pupils were being taught. Tests were devised to match the

teaching and learning that was taking place (Banyard, 2010). The techniques for current GCE examinations are largely the same today even though the style of teaching and learning has moved on dramatically. A major change concerns digital technologies which have transformed the way we access information, the way we construct written work and even the way we think. Today's students are digital natives (Prensky, 2001) and their assessments do not reflect their new skill set.

A second issue of concern with assessment has been the drive towards tests that are easy to administer and easy to teach to. This approach makes it strategic to 'teach to the test' (Halonen et al., 2003) and in so doing minimise the more sophisticated and subtle aspects of student learning. The strategic approach to assessment can influence student learning (Conner-Greene, 2000) as it becomes strategic for the student to focus on the text and therefore not engage in more advanced kinds of thinking and learning because the assessments simply do not demand it (Bol & Strage, 1996).

Student perceptions of psychology

The teaching of psychology in schools continues to attract mixed opinions from the press and from policy makers. But what do the students think of it? Surveys of psychology undergraduates (Linnell, 2003; Rowley et al., 2008) have revealed broadly positive attitudes towards GCE psychology, with those having taken the course judging themselves better prepared for degree-level study than those without (Rowley et al, 2008), and over 90% of respondents in the Linnell survey reporting that GCE psychology helped with their study skills and subject understanding. Interestingly, modelling the relationship between pre-degree grades and degree outcome (e.g. Betts et al., 2008) has shown that having a GCE qualification in psychology is not related to undergraduate attainment, and for those who take the course their final grade does not relate to subsequent attainment either.

Psychology is often perceived in the UK as a soft option (see above) but is this how students find it? The experience of the learner is a valuable addition to an analysis of the subject as it is taught. In the survey reported here we collected perceptions of the perceived difficulty, interest and relevance of psychology compared to other subjects that they had studied. This allowed us to examine whether student perceptions of the subject match the view of observers and commentators.

It is important to contextualise this data by exploring the combinations of subjects that students take at A-Level. If Psychology is, in fact, a soft option then we would not expect it to feature alongside traditional subjects such as Biology, Chemistry and History, for example. However, an analysis of A Level choices for all students who applied to study at a UK university during the 2010/11 application cycle and who obtained at least one A level (Rodeiro & Sutch, 2013) showed the prominence of A-Level psychology in mainstream choices. For example, of all students accepted onto university subjects allied to Medicine, 25.3% of them had completed an A-Level in Psychology and for degrees in Biological Sciences the proportion was 49.5%. Students commonly take three subjects at A-Level and analysis of popular combinations of A Levels finds that Psychology features in the top twenty combinations of subjects with, in particular, Biology and Chemistry, English Literature and History, and Biology and Maths (Rodeiro & Sutch, 2013). These data indicate that students place Psychology alongside these mainstream subjects and our comparison data below should be viewed in this context.

Student perceptions of the content of psychology are framed by the material they are taught, but do these perceptions then match with the view that the profession has of itself? Research into student misconceptions of psychological ideas (Gardner & Dalsing, 1986; Kowalski & Taylor, 2009) shows that ideas about psychology are commonly not based on evidence and often resistant to challenge. The measurement of these misconceptions, however, has been shown to be influenced by the structure of the questions and the language that is used (Hughes, Lyddy & Kaplan, 2013). In this study we chose to look at the judgement of eminence as an indication of student perceptions of psychology.

Who are the psychologists who are regarded as most eminent? A review of eminence using judgements from people in the profession (Haggbloom et al. 2002) gives us psychologists' view of themselves. Another measure of eminence and one that will have greater impact on student perceptions is the frequency of citation in textbooks (Gorenflo & McConnell, 1991; Griggs & Proctor, 2002, Griggs & Jackson, 2007). Our interest was to see who is judged to be eminent by UK students in 2012 and how that compared to their judgement in 2001, as well as to judgements by the profession.

The BPS commissioned a report into the future of GCE Psychology (BPS, 2013) which built on previous reports on this issue (BPS, 1992; McGuinness, 2003). As part of this report research was commissioned into the experiences of teachers and students of this qualification. We report here the student survey.

Method

The survey of GCE students in the UK was based on a previous survey carried out also for the BPS in 2001 (McGuinness, 2003). Similar questions were used to allow comparison and to track changes over a 10 year period. The survey was created online at SurveyMonkey and responses were collected over a period of one month.

Sample

The participants were recruited through elists of teachers of psychology and through the online facility *psychexchange* (now available at www.resourcd.com). This sampling technique reached teachers of psychology who then forwarded the link to their students. The technique was similar to that used by the 2001 survey which also collected data online. There were 870 responses of which 75.5% were female and 24.5% male, which reflects the gender split observed in examination entries at GCE. It also mirrors the demographics of the 2001 survey (males 26.7%, females 73.3%, n = 426). The mean age of respondents was 17.2 years (17.5 in 2001) and the standard deviation was 0.79 (3.23 in 2001).

Questions

The survey was brief in order to maximize participation and most of the questions were taken from McGuinness (2003). The questions asked for comparison of their psychology studies with other subjects they had studied (see Appendix A for the full questionnaire). Respondents were also asked to reply to four free text questions;

> *The things I like BEST about my psychology course are ...*
>
> *The things I like LEAST about my psychology course are ...*
>
> *What do you think would make the psychology course better?*

What advice would you give to a friend who was thinking of studying psychology?

Finally, in order to get a picture of their representation of psychology, respondents were asked;

Who do you think are the THREE most important or influential psychologists?

Analysis

Descriptives of the comparison questions are presented.

Results

Tables 1 – 8 show the percentage responses to the questions in 2012 and 2001. The results show a stability in response patterns over the two times. Tables 2-5 show the responses of comparison to other subjects being studied. Table 6 reports student expectations of the course, Table 7 reports the indication to continue further study in Psychology confirming the response shown in Table 1 to the question about career ambition. Table 8 reports how much students endorse their original choice to study Psychology.

Table 1. Why did you choose to study psychology?

	2012	*(2001)*
I want a career or further study in psychology	23.0%	*(18.5%)*
It sounded interesting	61.9%	*(64.1%)*
It is something different to study	8.7%	*(11.0%)*
Other	6.5%	*(6.4%)*
n	864	*(454)*

Note: there were more options than reported here but the others attracted few responses

Table 2. Compared to other subjects I am studying or have studied psychology is

	2012	*(2001)*
much more interesting	47.0%	*(44.8%)*
a bit more interesting	29.1%	*(35.4%)*
about the same	13.7%	*(15.3%)*
a bit less interesting	7.4%	*(3.3%)*
much less interesting	2.8%	*(1.2%)*
n	868	*(454)*

Table 3. Compared to other subjects I am studying or have studied psychology is

	2012	*(2001)*
much more relevant to my life	34.8%	*(31%)*
a bit more relevant to my life	36.3%	*(38%)*
about the same	15.9%	*(21%)*
a bit less relevant to my life	10.1%	*(8%)*
much less relevant to my life	2.8%	*(2%)*
n	864	*(454)*

Table 4. Compared to other subjects I am studying or have studied psychology is

	2012	*(2001)*

much more difficult	14.9%	*(15.4%)*
a bit more difficult	34.9%	*(27.5%)*
about the same	33.3%	*(30.2%)*
a bit less difficult	14.1%	*(21.6%)*
much less difficult	2.9%	*(5.3%)*
n	866	*(454)*

Table 5. Compared to other subjects I am studying or have studied psychology is

	2012	*(2001)*
much more work	25.3%	*(22.9%)*
a bit more work	36.3%	*(26.7%)*
about the same	30.8%	*(38.1%)*
a bit less work	6.5%	*(10.4%)*
much less work	1.2%	*(2.0%)*
n	867	*(454)*

Table 6. My psychology course is

	2012	*(2001)*
very much as I expected	19.7%	*(24.2%)*
fairly much as I expected	52.1%	*(50.7%)*
different to what I expected	28.2%	*(25.1%)*
n	866	*(454)*

Table 7. Do you want to study psychology further when you have finished this course?

	2012	*(2001)*
yes	30.6%	*(35.9%)*
maybe	36.8%	*(39.0%)*
no	32.6%	*(25.1%)*
n	863	*(454)*

Table 8. I am glad I chose to study psychology

	2012	*(2001)*
Strongly agree	50.9%	*(42.7%)*
Agree	31.7%	*(30.0%)*
Neither agree or disagree	10.6%	*(20.3%)*
Disagree	4.1%	*(4.8%)*
Strongly disagree	2.7%	*(2.2%)*
n	864	*(454)*

The request to name 3 important or influential psychologists attracted a total of 2278 responses. Table 9 shows the top 15 responses along with the proportion of respondents naming them. Data from 2001 are also presented (n = 1009). Also included are the ranks in the list of 100 most eminent psychologists of the 20th century (Haggbloom et al. 2002) and the citation ranks in text books (Griggs & Proctor, 2002).

Table 9. Important or influential psychologists

2012	2012 % of	*2001 % of*	*2001*	APA	Citation

rank	Psychologist	respondents	*respondents*	*rank*	rank*	rank**
1	Freud	78.5	*83.8*	*1*	3	1
2	Milgram	23.0	*47.9*	*2*	46	24
3	Zimbardo	19.1	*36.3*	*3*	-	-
4	Bowlby	17.5	*5.9*	*9*	49	-
5	Skinner	17.4	*4.5*	*12*	1	3
6	Bandura	16.7	*22.9*	*4*	4	8
7	Pavlov	10.3	*3.0*	*15*	24	6
8	Loftus	10.0	*7.1*	*7*	58	16
9	Ainsworth	8.4	*< 1.0*	-	-	-
10	Rosenhan	5.1	*< 1.0*	-	-	-
11	Asch	3.7	*2.1*	*17*	41	-
12	Baddeley	3.0	*< 1.0*	-	-	39
13	Baren-Cohen	2.9	*5.4*	*9*	-	-
14	Money	2.6	*< 1.0*	-	-	-
15	Watson	2.5	*< 1.0*	-	16	12

* Haggbloom et al (2002)
**Griggs & Proctor (2002)

We present here data from two of the free response questions. The further two questions attracted responses very similar to the first two questions and are not reported here. There were 819 responses to the request to identify '*The things I like BEST about my psychology course…'*. The most common area for comment was the general nature of the learning experience with mentions of it being interesting (n=301), different to other areas of study (n=203) and being enjoyable and fun (n=45), for example *"It's interesting and leads to fun debates. It's challenging and requires you to think, even after you leave the classroom."* and *"The variety of different topics is interesting and it never gets boring."* Many commented on the impact of their teacher (n=76), for example *"The teachers are fantastic. Very interesting people, and engaging our minds."* Responses also focused on the connection of psychology to their own experiences with mentions for everyday life (N=201), relevance (n=59) and the applications of the subject (n=102), for example *"Learning the multiple theories of behaviour and how they contrast with one another, it helps me understand myself and other people better."* and *"It's really interesting and I have really engaged with the topics I've studied. I feel that I can apply what I've learnt in everyday life and not just in the classroom."* Individual curriculum areas were identified such as biological psychology (n=22) and social psychology (n=43) and the greatest interest was shown in abnormal psychology (n=72), for example, *"The topics that cover abnormality or psychopathology, such as Eating Disorders and Phobic Disorders."*

There were 804 responses to the request to identify '*The things I like LEAST about my psychology course…'*. The most common area for comment was the structure of the assessment and the impact on the learning. There were comments about the examinations (n=155), the way they are marked (n=40) the quantity of information (n=118) and the necessity to remember material (n=171). Examples of these points are *"The content is very heavy and feels more like a memory test in the exam."* and *"Having such a large amount of information to learn and knowing only a small section of this information is tested."* There were a few negative comments about the course

being boring or dull (n=31) though these were balanced by responses that said there was nothing in the course to dislike (n=29), for example, *"It is all theory and written work, it can be dull at times."* and *"Nothing. Its hard work but I enjoy it."* There were comments about teachers (n=24), for example, *"The teacher's methods of teaching are extremely poor as is their attitude to our enthusiasm."* The main curriculum area to attracted negative comments was research methods (n=122), for example, *"It can be very challenging, especially research methods."*

Discussion

Student perceptions give valuable evidence about the impact and effectiveness of psychology courses. Most remarkable in the findings is the robustness of the data from the 2001 survey. The responses to the first 8 questions show very little change between the two data collection points despite big changes in the structure of the GCE qualifications during that time and substantial changes in the syllabuses. Such changes in response as there are show a hardening of attitude in favour of psychology (interest, relevance) and perception of difficulty and work required.

The endorsement of the subject as more interesting (78.1%) and more relevant (71.1%) than other subjects is dramatic and confirms the positive position of the subject in student perceptions. This popularity and endorsement of the subject has been maintained even though the numbers taking the course have doubled since the 2001 survey (McGuinness, 2003). This growth has taken place in the context of a reluctance by the UK Department of Education to support the training of specialist teachers of psychology (BPS, 2013). Despite this challenge to teachers and teaching students further endorse the subject by confirming that they are glad they chose the subject (82.6%).

The comparison questions about the load of the course found that psychology was perceived to be more difficult (49.8%) and required more work (61.6%) than other subjects. These perceptions challenge the notion that psychology is an easy option and one that is not valued by students (Daily Telegraph, 2011; Russell Group, 2011) especially given the finding that the comparison subjects are likely to be Maths Chemistry, Biology, History and English (Rodeiro & Sutch, 2013). A question that arises from this but is not considered here is why the perception of psychology as an easy option has developed in the UK despite evidence to the contrary. One speculation is that the subject is not part of the traditional school curriculum and as such does not feature prominently in elite schools.

Students predominantly choose psychology because they believe it will be interesting (61.9%) and the majority experience it to be much as they expected (71.8%). Given the scientific content of the GCE courses and its place in the national curriculum as a science subject these responses are surprising. It indicates that students have made an informed choice about psychology and not chosen it because they believe it to be easy. The second most common reason for choosing the subject is a wish to continue studying it beyond school (23.0%) and this firms up during the course to the point where the majority say that that they may wish to continue with it (67.4%).

The responses to the open questions confirm the quantitative data. Students viewed psychology as interesting, challenging and relevant to their everyday lives. The main focus for negative responses was the assessment of the course and its impact on teaching and learning. Although it is not surprising for students to view assessment

negatively it is the specifics of the these comments, such as the importance of remembering detail and of not being able to show what they know and understand that stand out here.

The response to the question on eminent psychologists gives an interesting picture of student perceptions of psychology. The survey confirms the place of Freud, Milgram and Zimbardo as the key figures of student psychology in the UK, though their endorsement scores have all slipped since 2001. Freud appears high in the citation list and APA eminence list as well though his ideas rarely form a part of the UK undergraduate curriculum. Milgram likewise appears on the other lists though Zimbardo's eminence appears only to be a student perception. The surprising loss from 2001 to 2012 is Piaget, though the other two losses from the top ten of 2001 (Piliavin, and Gardner & Gardner) are associated in students perceptions with one key study each and these studies are not so commonly studied in 2012.

The list, as is often the case with eminence lists, is dominated by men though for 2012 Mary Ainsworth has joined Elizabeth Loftus in the student list. This perception of psychology as male dominated does not reflect the current output of research or the student demographic. Women are not the only group missing from the list and concern about the choice of example studies in curricula led the BPS to recommend in its report;

> All students should feel included within the content of psychology. To ensure that as many people are included as possible it is necessary to place special emphasis on cultural, social and individual diversity. (BPS, 2013, page 16)

Furthermore, the list is largely peopled with historical characters and shift between 2001 and 2012 has been towards older researchers rather than seeing the introduction of more contemporary work. For example Skinner, Bowlby and Pavlov have all trebled their endorsements and Watson makes it onto the bottom of the list as well. Even the arrival of Ainsworth in the list adds to the historical rather than contemporary content. It may be that this perception of eminence does not reflect the content of the courses, but as presented here, the psychology curriculum appears to be stuck in time.

Conclusions

Psychology has an established place in the UK school curriculum and has maintained a strong response from students since the start of this century. Students clearly hold the subject in high regard as shown by its popularity, by the combinations of A-Levels they choose and also by their perceptions presented here. This high regard has been maintained over the last decade despite a range of negative representations of the subject being put forward by the press, the UK government and by UK universities. This high regard is something to celebrate.

Alongside this celebration there are causes for concern. The programme of study at A-Level appears to have a historical bias that is excluding new ideas and contemporary psychologists. A further cause for concern is the continuing challenge to the subject by educational institutions and the pressure on high performing schools to steer their students towards the 'facilitating subjects' as defined by the Russell Group and away from Psychology.

The message from psychology to policy makers is that the student representation of psychology in the UK is of a subject that is interesting, engaging, challenging and

relevant. It is the personal science that contributes to the community beyond the restraints of school curricula and assessment. It is core curriculum.

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Statement of authorship

Philip Banyard is first author on six of the publications presented here. Professor Jean Underwood is first author on the other two. The following is her statement concerning the contribution of Philip Banyard.

1. Underwood, J., & Banyard, P. (2006). Learning and technology: A happy conjunction? In K. Steffans, R. Carneiro & J. Underwood (Eds.), *Self-regulated learning and technology enhanced learning environments* (pp. 64-71). Aachen: Shaker Verlag.

This paper resulted from evidence collected as participants on an EU grant. This was a combined and equal effort by Philip Banyard and myself.

2. Underwood, J., & Banyard, P. (2008). Managers', teachers' and learners' perceptions of personalised learning: Evidence from Impact 2007. *Technology, Pedagogy & Education, 17(3),* 233-46.

This paper presents key data from a Becta grant on which Philip Banyard was research manager and I was PI. Philip Banyard and I jointly wrote the research instrument and he conducted the analyses. We wrote several papers from this an associated grants and first authorship was rotated as equal partners in the endeavour

With regard to paper 8, the following is the statement from Karen Duffy concerning authorship.

"In respect of the article,

> Banyard, P. & Duffy, K. (2014). Student representations of psychology in the UK. Psychology Teaching Review, 20(2), 110-120

I can confirm that Philip Banyard was the lead author on this paper. My contribution was to review drafts and add comments.

Karen J Duffy
Principal Lecturer , Head of Secondary Partnerships
Manchester Metropolitan University.
Faculty of Education."

Appendix 1

Additional publications

Appendix 1: Additional publications

Papers

Banyard, P. (1993). A level psychology: More than a list of names and dates. *Psychology Teaching Review, 2,* 2-11.

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Reports

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Appendix 2

Re-analysis of data from Impact 2007 and Impact 2008.

Appendix 2: Re-analysis of data from Impact 2007 and Impact 2008.

Phil Banyard, August, 2014

This analysis combines the questionnaire data from Impact 2007 (Underwood et al., 2007) and Impact 2008 (Underwood et al., 2009a). The two research projects used similar surveys, and for this report they have been adjusted and aligned to give one combined data set.

The analysis reported here investigates what are the motivational patterns of learners across the schools years and what are the perceptions that learners have of their own learning and the way they are being taught. The analysis goes on to look at the factors in the school and the teaching space that impact on the performance at standardised tests. Furthermore it considers the key question of the impact of standardised national tests on the learning strategy of the school. Do schools who promote autonomy and independent learning gain the maximum benefit (in terms of result scores) or is there a more effective strategy? This analysis explores the impact of independent learning by drawing on data from school level, teacher level and learner level variables. Finally, it examines whether autonomy and independent learning have an impact on learners' engagement and the value they place on their education.

Method

Sample

Eighty-seven UK primary and secondary schools took part in this study over a two-year period (see Table 1). The selection of schools was by invitation to join a project assessing the impact of new technologies on teaching and learning. While not of central importance to the current question, the schools varied in their level of technology use and knowledge, that is their e-maturity. Over 6000 pupils took part in this study of which just under 40% were primary pupils (Table 1).

Table 1. Number of learners and schools providing pupil responses by school sector and year of survey.

Year	2007 Learners (Schools)	2008 Learners (Schools)	Total Learners (Schools)
Primary Learners Schools	1085 (23)	1336 (20)	2421 (43)
Secondary Learners Schools	1563 (26)	2434 (18)	3997 (44)
Total Learners Schools	2648 (29)	3770 (38)	6418 (87)

School demographics

The following nationally held school-level statistics of deprivation, socio-economic status, engagement with the school, proportion pupils requiring additional support, and performance were acquired for each participating school:

- *Percentage of free school meal entitlement (FSME) as a measure of deprivation. FSME* is a

widely used proxy indicator for deprivation in the UK. FSME are accepted as a measure for deprivation because they are linked to the children in the school, readily understood, readily available, updated annually and income-based.

- *ACORN Data (A Classification Of Residential Neighbourhoods) as a measure of socio-economic status of the school area.* This geo-demographic information system uses census data and other information such as lifestyle surveys to classify areas into one of 57 socio-economic sub-types at UK postcodes level (available at http://acorn.caci.co.uk).
- *Proportion of unauthorised absences (absences for which no satisfactory explanation is provided) as a measure of general engage with the school.* While the reasons behind such absences are often multi-dimensional, they do indicate a negative attitude to schooling. Malcolm, Thorpe and Lowden (1996) found that while teachers cite socio-economic pressures as the cause of many unauthorized absences, pupils considered boredom, workloads, dislike of the teacher, school or certain subjects, or simply wanting to stay in bed as the main reasons for opting not to attend school. While in a more recent study Sälzer et al. (2011) identified three strong predictors of unauthorized absence above and beyond student background: (1) workload perceived as too low, (2) achievement standards perceived as low, (3) stress as a result of a rapid instructional pace. They conclude that unauthorized absences are a form of adolescent feedback on the attractiveness of schools. Thus while the causes of demotivation may be complex the use of unauthorized absences does capture a general rejection of school.
- *Percentage of learners receiving Special Educational Need (SEN*) support as a measure of the level of pupils requiring additional support. The legal definition of a SEN pupil is one who has learning difficulties or disabilities that make it harder for them to learn or access education compared to their chronological peers (gov.uk, 2013). Formal acknowledgement of such needs, that is statementing, results in additional resources being allocated to support the pupil
- *School average point score* (APS) on national tests at Key Stage 2 (primary, year 6) and Key Stage 3 (secondary, year 9) as a measure of school performance. The APS at Key Stages 2 and 3 is the sum of all scores gained in English, mathematics and science by relevant pupils divided by the total number of relevant pupils.

Measures of pupil responses to school and to learning in general

The learner questionnaire was developed from previous studies into learner attitudes (Midgley et al., 2000; Martin & Marsh, 2006; Pintrich & De Groot, 1990). The 7-factor scale developed here was grouped under three key areas of pupils' responses to their educational experience:

1. Perceptions of the teaching environment;
2. Self-perceptions of their own performance and ability;
3. Self-perceptions of the value they placed on learning.

The 7 factors were distributed across these three areas as follows:

1. Perceptions of the teaching environment (minimum score 14; maximum score 70):

i. *supported autonomy*, 6 items (for example, ‘In class I can work at my own pace’), alpha = .81

ii. *student focused support*, 4 items (for example, ‘My teacher helps me to understand my own way of learning’), alpha = .75

iii. c*hallenge*, 4 items (for example, ‘Once I have solved a problem my teacher gives me a harder task’), alpha = .71

2. Self-perceptions of their own performance and ability (minimum score 6; maximum score 30):

    i. *self-efficacy*, 3 items (for example, ‘If I try hard I believe I can do good work’) , alpha = .80

    ii. *persistence*, 3 items, (for example, ‘I work hard to get good marks even when I don’t like the topic), alpha = .71

3. Self-perceptions of the value they placed on learning (minimum score 12; maximum score 60):

    i. *value*, 6 items, (for example, ‘It is important to me that I do well in school’), alpha = .79

    ii. *engagement*, 6 items, (for example, ‘I don’t really care about school anymore’), alpha = .77.

Most learners completed the survey on-line in one session although the facility to complete the questionnaire over more than one session was available and was used in a small number of cases.

Ethics

Schools were offered a small financial payment in recognition of the need for staff involvement in collection of a wide range of data. All procedures conformed to the British Psychological Society’s guidance on ethical conduct of research.

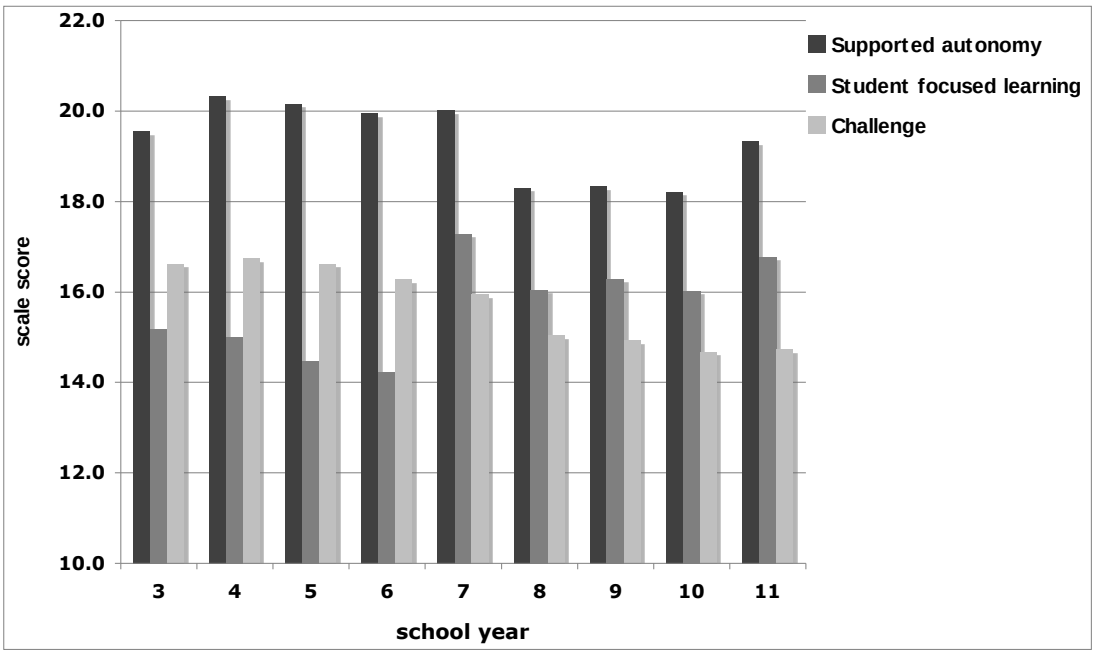
Results

Descriptives

a. Perceptions of the teaching environment

The most striking pattern is the perception of supported autonomy across school years. The sense of autonomy shows a sustained declined until year 11 when most students are preparing for their assessments leading to their General Certificate of Secondary Education (GCSE). A similar pattern of decline is seen in the reports of the degree to which their learning challenged them though without the rise in the GCSE year (Figure 1). This pattern is not followed in the third scale that explores self-perceptions of learning, and there is little or no difference across years in perceptions of student-focused support, which are consistently towards the top of the scale.

Figure 1: Learner perceptions of supported autonomy, student focused learning and challenge by school year.

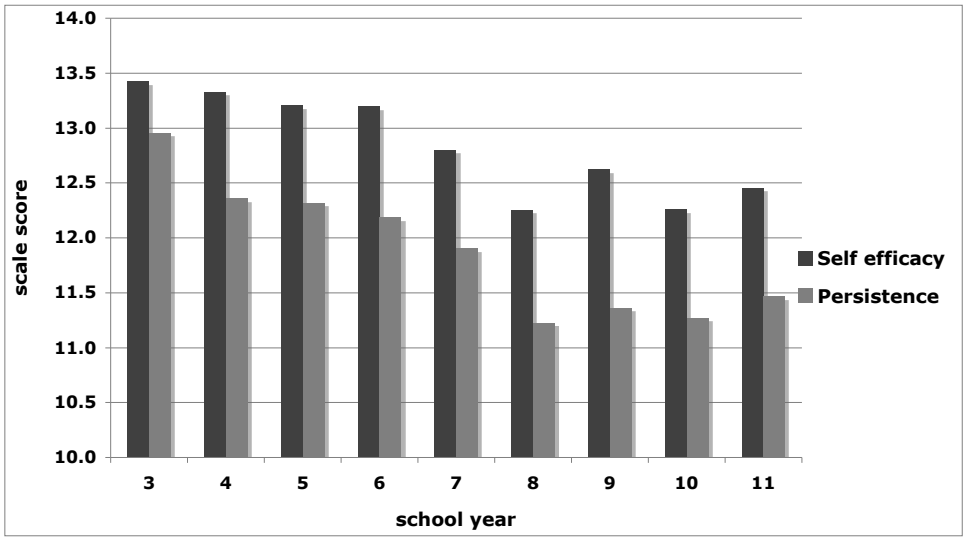


NB: Mean Min, Max scores for supported autonomy 6,30; student focused learning and challenge 4,20.

b. Self perceptions of performance and ability

Both scales that record self-perceptions of performance and ability show a steady decline across the school years. Self efficacy declines throughout the school career which matches the decline in supported autonomy, and the reports of persistence in the face of difficulty also decline (Figure 2).

Figure 2: Learner perceptions of self-efficacy and persistence by school year.



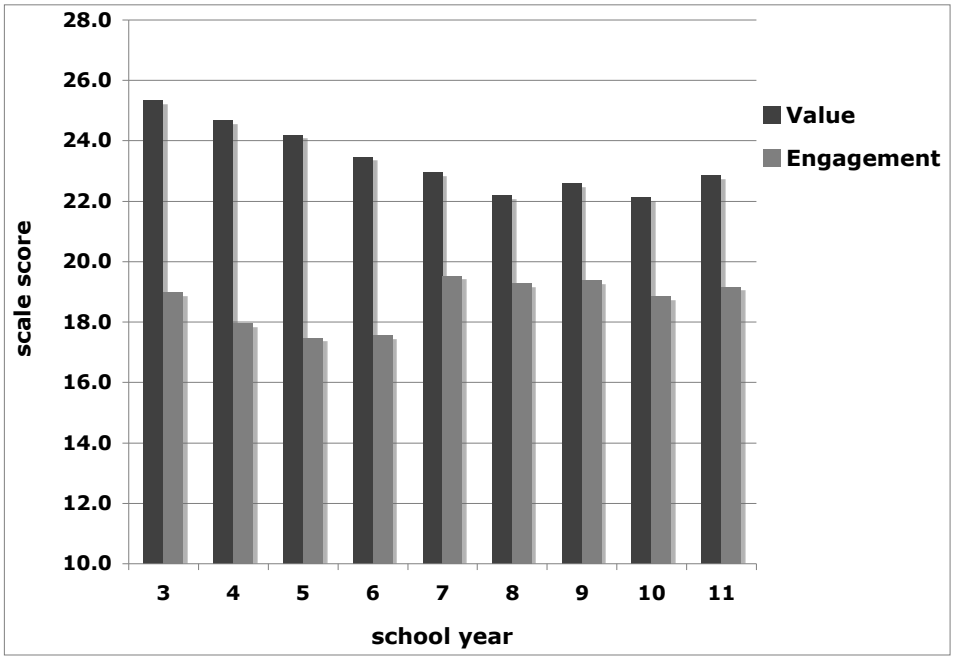
NB: Mean Min, Max scores for self efficacy 3,15; persistence 3,15

c. Self-perceptions of the value placed on learning

There is a mixed response here with the scale of value conforming to the pattern of decline, though in this case there is a rise at year 11 (see Figure 5). The final scale of

disengagement shows no pattern of decline with, if anything, secondary learners showing a greater sense of engagement than primary learners.

Figure 3: Learner perceptions of the value of their learning by school year.



NB: Mean Min, Max scores for value of learning 6,30.

Further analyses

Here and for the regression analyses there were very few missing data (less than 1% of cases), Where such missing data occurred composite variables were created based on the average of completed items for each measure.

Bivariate correlations

We next examined the implications that students' motivational orientations might have for their academic achievement. Bivariate correlations among students' self-reported perceptions and their academic performance on national tests.

a. Primary schools

The data shows associations between the school environment measures and the average performance of the schools at Key Stage 2. These measures also associate with the value learners place on their education. There are also associations between the teaching environment measures and the learner experience measures of engagement and value (see table 2).

Table 2: Bivariate correlations for primary (elementary) schools

SEN statement	1									
unauthorised absence	.18	1								
Free school meals %	.46**	.35*	1							
ACORN	.31*	.16	.58**	1						
supported autonomy	.05	-.21	.19	.20	1					
student focused support	.11	-.12	.21	.20	.72**	1				
challenge	.29	-.05	.25	.32*	.26	.48**	1			
self efficacy	.17	-.20	.09	.26	.33*	.34*	.33*	1		
persistence	.30	-.11	.13	.15	.08	.27	.52**	.46**	1	
value	.28	-.04	.38*	.29	.34*	.54**	.63**	.60**	.81**	1

engagement	.12	-.19	-.25	-.12	**-.41****	**-.34***	-.20	.06	.24	-.01	1	
Key Stage 2	-.20	**-.45****	**-.71****	-.23	.07	.08	.03	.13	.09	.02	.01	1
	SEN statement	unauthorised absence	Free school meals %	ACORN	supported autonomy	student focused support	challenge	self efficacy	persistence	value	engagement	Key Stage 2

* p < .05, ** p < .01,

b. Secondary schools

As with the primary schools, the data shows associations between the school environment measures and the average performance of the schools at Key Stage 3. There is also an association between one of these measures and the value learners place on their education. There are also strong associations between the teaching environment measures and the learner experience measures of engagement and value (see table 3).

Table 3: Bivariate correlations for secondary (high) schools

SEN statement	1											
unathorised absence	**.32***	1										
Free school meals %	.25	.24	1									
ACORN	-.02	.11	**.43****	1								
supported autonomy	.03	.13	.17	.17	1							
student focused support	.10	.18	.29	.23	**.87****	1						
challenge	.08	-.03	.19	**.38***	**.55****	**.73****	1					
self-efficacy	-.02	-.12	.24	.30	**.34***	**.47****	**.63****	1				
persistence	.25	.17	**.36***	.28	**.52****	**.68****	**.73****	**.69****	1			
value	.10	.06	**.36***	**.31***	**.51****	**.72****	**.75****	**.84****	**.82****	1		
engagement	-.28	-.01	-.02	**.31***	.21	**.34***	**.57****	**.51****	**.44****	**.60****	1	
Key Stage 3	-.25	**-.28***	**-.65****	**-.35****	-.27	**-.34***	-.10	-.27	**-.36***	**-.37***	.10	1
	SEN statement	unathorised absence	Free school meals %	ACORN	supported autonomy	student focused support	challenge	self-efficacy	persistence	value	engagement	Key Stage 3

* p < .05, ** p < .01,

These associations were further explored in regression models.

Regression analyses

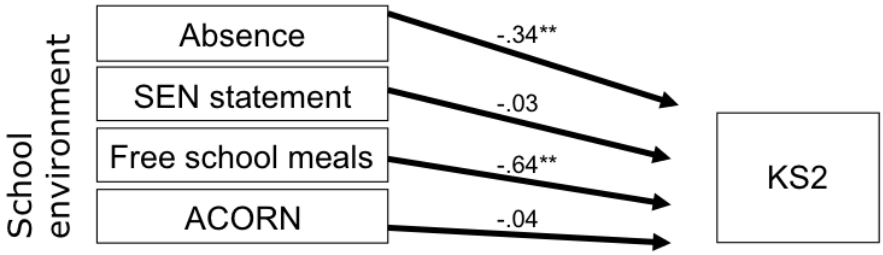
The first model tested the impact of school level factors on average performance at Key Stage 2 (primary) and Key Stage 3 (secondary).

a. School environment and performance: Primary schools

A multiple linear regression was carried out with average KS2 performance as the predicted variable and 4 environment variables from the (proportion of learners statemented as requiring SEN, proportion of unauthorized absences, percentage of free school meals, and ACORN scores) as the predictors. The regression was a moderate fit (Cohen, 1992) explaining 56% of the variance (R^2adj = .56) and the overall relationship was significant: F(4,40) = 15.0, p < .001.

The significant predictors of average KS2 performance are shown in Figure 4 of the model. Standardized betas are reported with * indicating p <.05 and ** indicating p < .01.

Figure 4: Path diagram for Model One (primary schools) showing the impact of school environment on Key Stage 2 performance

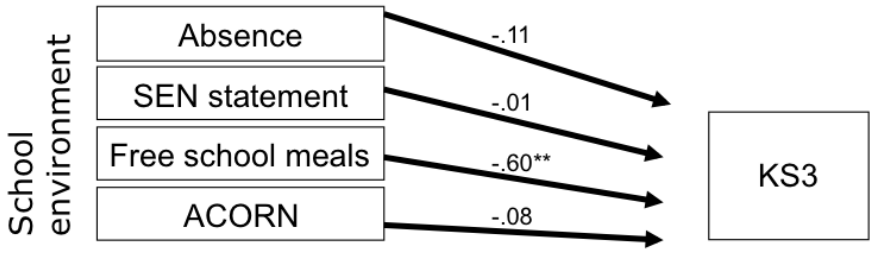


b. School environment and performance: Secondary schools

A multiple linear regression was carried out with average KS3 performance as the predicted variable and 4 environment variables from the school (proportion of learners statemented as requiring SEN, proportion of unauthorized absences, percentage of free school meals, and ACORN scores) as the predictors. The regression was a moderate fit explaining 41% of the variance (R^2adj = .41) and the overall relationship was significant: F(4,49) = 10.2, p < .001.

The significant predictors of average KS3 performance are shown in Figure 5 that illustrates the model. Standardized betas are reported with * indicating p <.05 and ** indicating p < .01.

Figure 5: Path diagram for Model One (secondary schools) showing the impact of school environment on Key Stage 3 performance



The above models test the influence of school environment on the average performance of the learners. We now develop that model to add a second group of variables concerning the teaching environment provided by the school. By adding the data from the self-perceptions of the teaching environment to the model we improve the predictive value of the model at both primary and secondary level.

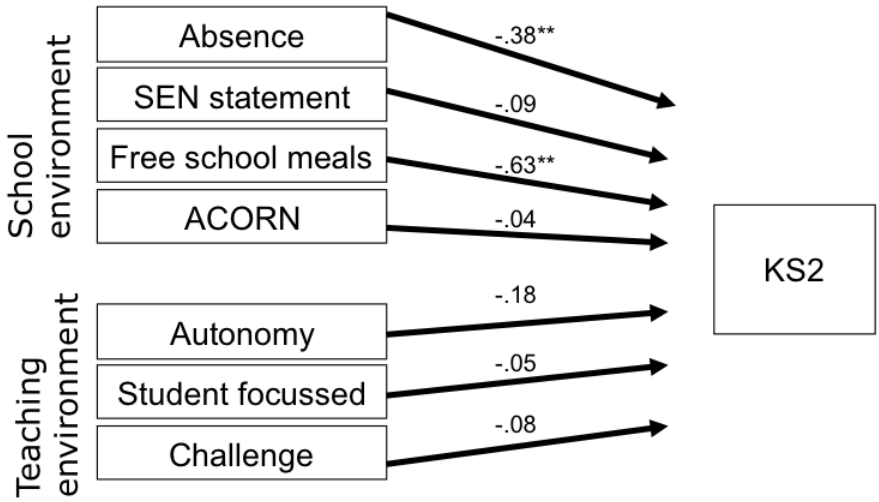
c. Teaching environment, school environment and performance: primary schools

The variables of supported autonomy, student focussed support and challenge were added to the above model. The regression was a moderate fit explaining 60% of the

variance (R^2adj = .60) and the overall relationship was significant: F(7,28) = 8.5, p < .001.

The significant predictors of average KS2 performance are shown in Figure 6 that illustrates the model. Standardized betas are reported with * indicating p <.05 and ** indicating p < .01.

Figure 6: Path diagram for Model Two (primary schools) showing the impact of school environment and learning environment on Key Stage 2 performance

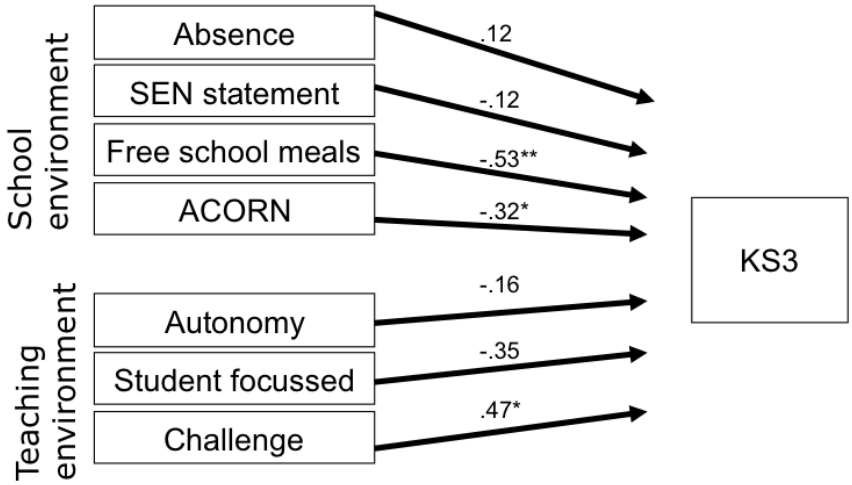


d. Teaching environment, school environment and performance: secondary schools

The variables of supported autonomy, student focussed support and challenge were added to the above model for the secondary school. The regression was a moderate fit explaining 50% of the variance (R^2adj = .50) and the overall relationship was significant: F(7,31) = 6.5, p < .001.

The significant predictors of average KS3 performance are shown in Figure 7. Standardized betas are reported with * indicating p <.05 and ** indicating p < .01.

Figure 7: Path diagram for Model Two (secondary schools) showing the impact of school environment and learning environment on Key Stage 3 performance



A further question concerns the effect the impact of these variables on the learners' view of their own learning. What will be the impact of the school environment and the teaching environment on the learners? Using a similar model to the above we substituted the school performance scores (KS2 and KS3) as the predicted variables

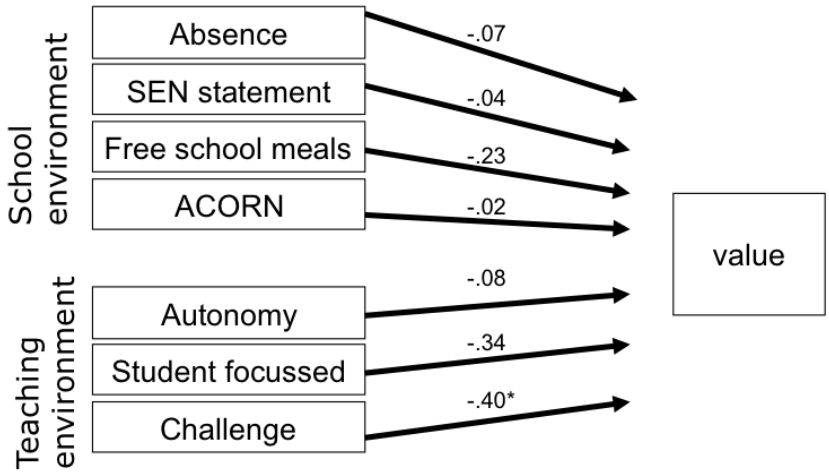
and looked at the impact on learner engagement and learner value for their education. The strongest effect was on the value of learning scores.

e. Teaching environment, school environment and value of learning: primary schools

The variables of school environment (proportion of learners statemented as requiring SEN, proportion of unauthorized absences, percentage of free school meals and ACORN scores) and teaching environment (supported autonomy, student focussed support and challenge) were the predictors and value of learning was the predicted variable. The regression was a moderate fit explaining 39% of the variance (R^2adj = .39) and the overall relationship was significant: F(7,29) = 4.3, p < .001.

The significant predictors of self-reports of value of learning are shown in Figure 8. Standardized betas are reported with * indicating p <.05 and ** indicating p < .01.

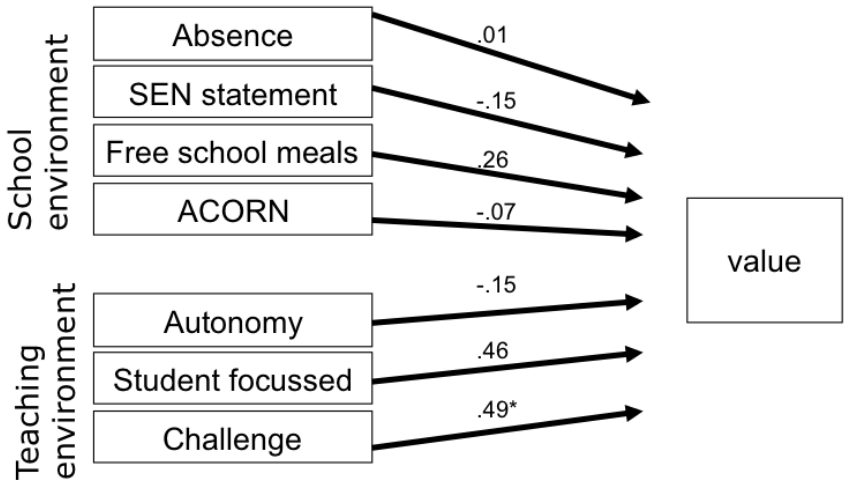
Figure 8: Path diagram for Model Three (primary schools) showing the impact of school environment and learning environment on self-reports of the value of education



f. Teaching environment, school environment and value of learning: secondary schools

The variables of school environment (proportion of learners statemented as requiring SEN, proportion of unauthorized absences, percentage of free school meals, and ACORN scores) and teaching environment (supported autonomy, student focussed support and challenge) were the predictors and value of learning was the predicted variable. The regression was a moderate fit explaining 62% of the variance (R^2adj = .62) and the overall relationship was significant: F(7,32) = 10.2, p < .001.

Figure 9: Path diagram for Model Three (secondary schools) showing the impact of school environment and learning environment on self-reports of the value of education



The significant predictors of self-reports of value of learning are shown in Figure 9. Standardized beta scores are reported with * indicating p <.05 and ** indicating p < .01.

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Appendix 3

Banyard, P. & Murphy, J. (2009) *ICT in FE Impact Study 2009.* Report for Becta

ICT in FE Impact Study 2009

Quantitative data report: *June 15th 2009*

Phil Banyard and Jamie Murphy, Nottingham Trent University

Report outline

Summary

The data

The first task of this project was to collate a database of useful and appropriate data for the investigation of the impact of ICT on achievement in colleges in the UK. No such database existed before this project although there is a wealth of data on individual colleges that can contribute to this analysis.

The database currently has data on all colleges in the UK. These include,

1. **e-Maturity data**: Results from the Harnessing Technology (HT) survey carried out by Becta for the years 2003 – 2006. The response rate to this survey has declined during that period from 257 to 121 colleges. The HT survey does not use the same questions year and year and so there are some issues of comparability. The HT survey data presented to the project included indices of e-Maturity calculated from the responses to the survey. The questions used to compute these indices varied from year to year and although they appear to be a useful measure, it would be advisable to have a more settled measure for future surveys.

2. **Ofsted data**: The project was presented with two cycles of Ofsted data from Becta comprising of data from 73 and 86 colleges respectively. The project also generated its own data from Ofsted reports through analysis of publicly available reports from 257 colleges. Ofsted reports are not conducted every year and for most colleges in the database we have data on one Ofsted report.

3. **Achievement data**: The project was given access to achievement data for the years 04/05, 05/06, and 06/07 for all colleges in the UK. Achievement variables include retention and success rates. This data includes breakdowns of achievement by age, by level of course and the subject area.

4. **Demographic data**: The project was able to college data on the region of each college, the location of each college and the type of each college.

The project had expected to receive data on student satisfaction but this was not forthcoming. The project team also considered that firm data on college size and budget spend on ICT would have been very useful for the analysis. These are variables that could be usefully added to the database in the future.

The first major outcome of the project has been to collate this database and make it available for analysis now and in the future. This is work in progress offers an opportunity for individual colleges to assess themselves against sector norms as well as providing a framework for further research.

The analyses

The underlying question of the project is to identify measurable effects of ICT on performance in colleges. The measures we used to explore this were e-Maturity (as a measure of ICT use) and achievement data. These analyses failed to find any major measurable effect. This is not unexpected given the findings of previous research in the school sector.

Further analyses were carried out to look for factors that might be influencing achievement but the findings were disappointing. Some statistically significant associations were found but these rarely rose above $r = 0.2$ which means we are not able to draw any firm conclusions or offer clear advice to colleges about future

practice. To look for differences between high and low e-Mature colleges the top and bottom 25% of colleges were selected and subjected to analyses of variance. These found some minor effects, though in some cases the low e-Mature colleges were out-performing the high ones. The data were also put though mathematical models to explore the impact of time on the variables and to look for any interaction between our measures. These analyses also failed to show any major effects.

One area that will be of interest to colleges is the relationship between e-Maturity and Ofsted reports. In 2 of the 3 years for which there was data available, the analyses showed moderate to strong relationships between the two variables. In other words the e-Mature colleges received better Ofsted ratings on most of the criteria used in the reports.

Past research has shown the importance of student responses when measuring the impact of ICT on performance. Student engagement is argued to be an important factor in achievement and for future research it is important to capture measures of the learner voice. A further finding of previous research has been to identify the transformational role of leadership within a college. The roll-out and embedding of ICT is dependent on this leadership and it will be important in future research to capture a measure of this.

Conclusions

The project has successfully initiated a database of information about college performance and ICT use. This data base has allowed analyses concerning the impact of ICT on achievement. So far, this has not shown any patterns that would allow for clear advice on changes in practice to be given to colleges.

Key variables concerning the learner voice and the leadership of ICT within colleges will be useful additions to the database in future projects.

Main Report

1. Background research

Policy makers take it as given that ICT will enhance education and the general economy but it should be noted that there is another view which argues that no substantial evidence has been brought forward to support this optimistic-rhetoric (Reynolds, Treharne & Tripp, 2003). The formal research evidence for beneficial effects of ICT in the classroom is not convincing despite the fact that teachers and pupils 'know' good things are happening (Cuban 2001). It is becoming clear that providing ICT equipment of itself is not enough to stimulate educational advances. Indeed, in some circumstances a focus on the ICT resources may inhibit learning. The reanalysis of the internationally comparative data on educational performance PISA (Programme for International Student Assessment) in a number of OECD countries found that computer availability at home could actually be detrimental to educational performance, while computer availability at school was found to show no discernible positive effect (Fuchs & Woessmann, 2005). Initial analysis had suggested a positive effect of computers but when variables such as background and resource level were taken into account the mere availability of computers did not translate into higher student performance. They observed a surprising inverted-U-shaped curve for performance against frequency of computer use:

- Little computer use, poor performance.
- Moderate computer use, higher performance.
- Frequent computer use, poor performance.

Fuchs and Woessmann suggest that this is a case of effective teaching methods being displaced by time in front of computer screens.

The recent reports for Becta on impact of new technologies on performance in schools considered a number of questions including

• Does e-Maturity have a positive impact on learner outcomes?

• Can empirical models be developed to support the transfer of good practice?

The reports found mixed results (Underwood et al., 2004, 2007, 2009). The Impact 2007 report found a weak relationship between the overall performance of the schools in terms of their Key Stage Test results and measures of e-Maturity. Within this data, however, there were some stronger relationships, for example at KS3 there was a measurable and significant relationship between e-Maturity and measures of school performances at Maths ($r = +0.45$, $p < .000$), and Science ($r = +0.40$, $p < .000$).

Impact 2008 found that e-Maturity of the school was a weak positive predictor of performance though the importance of institutional maturity was dwarfed by the impact of the learner focused factor of engagement. This factor had been identified in Impact 2007 and refers to the enthusiasm, sense of value and effort that learners bring to their work. It was measured through questionnaire responses from around 3,000 learners in each of Impact 2007 and 2008. The surprising finding of these reports was that learner attitudes were a better predictor of school performance than e-Maturity of the school The key variable was the engagement of the learners and when combined with measures of challenge of personalized learning it was able to predict the school performance at all Key Stages (Table 1).

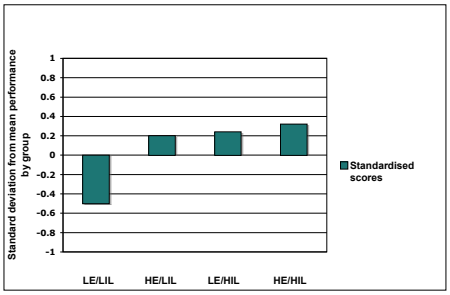
Table 1. The relationship between average Key Stage at a school and the learner variables of engagement, challenge and personalised learning.

Key Stage 1, adjusted $R^2 = 0.53$, $p < 0.01$
Key Stage 2, adjusted $R^2 = 0.64$, $p < 0.01$
Key Stage 3, adjusted $R^2 = 0.59$, $p < 0.01$

Key Stage 4, adjusted R^2 =0.64, p < 0.02

The work points to the need to take measures at a learner level in order to best predict performance in a school. Further analyses highlighted the relationship between these variables and e-Maturity. The data, collected at the institutional level, provided robust evidence of a relationship between e-Maturity, school performance and Investment in Learning by pupils. These two variables had a positive and additive effect on the school performance levels. While schools whose pupils showed low Investment in Learning (LIL) performed less well on national tests than those whose pupils were engaged with their learning, this finding was ameliorated by the level of e-Maturity. So schools, with high e-Maturity but low Investment in Learning (HE/LIL) outperformed those schools with both low e-Maturity and low Investment in learning (LE/LIL). Schools with both high e- Maturity and high pupil Investment in Learning (HE/HIL) outperformed fellow institutions on a range of national tests (KS2 to A level). This data is illustrated in Figure 1.

Figure 1, The impact of e-Maturity and pupil investment in learning on school performance



A further finding of the most recent Impact study was the relationship between measures of deprivation and the level of e-Maturity in the school. There was a consistent trend for the high e-Mature schools to have the more challenging catchments as measured by deprivation indices, statements of educational need and provision of free schools meals (adjusted R^2 = 0.41, F = 7.12, p < 0.001).

2. The Impact of ICT in Further Education data

The database for the Impact of ICT in Further Education study currently has 60 variables spread over 4 years from a total of 436 institutions (full list in appendix). The major components are data from

- OFSTED reports
- Becta e-Maturity survey over four years
- Achievement data over three years including breakdowns by age, level and subject
- College demographics including region, college type and college size.

All sets of data have been gathered from a selection of the colleges and the spread is shown in Table 2 below

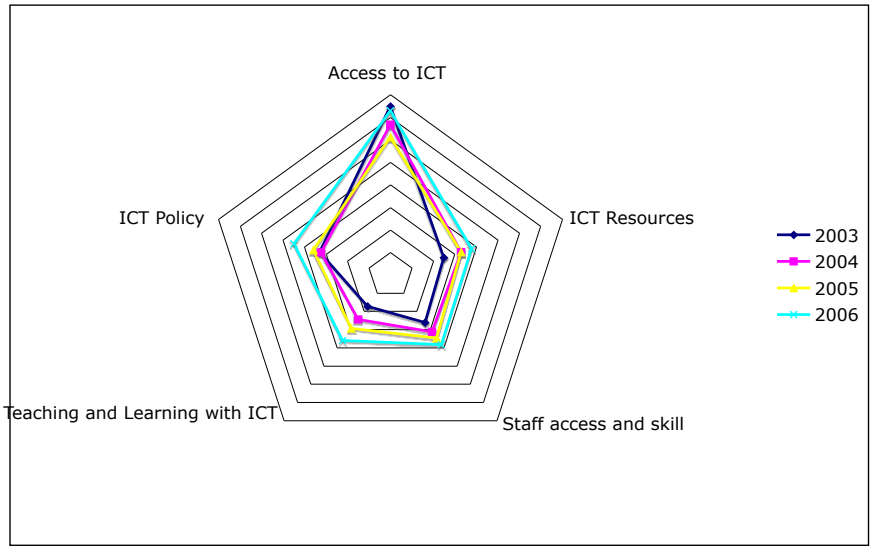
Table 2 Number of institutions in each data set

Data set	Number of institutions
Total number of institutions	436
OFSTED	
Inspection cycle 1	73
Inspection cycle 2	86
Inspection grades (collated from reports)	295
e-Maturity	
2003	257
2004	197
2005	162
2006	121
Achievement data	
2004/05	391
2005/06	400
2006/07	400

2.1. e-Maturity

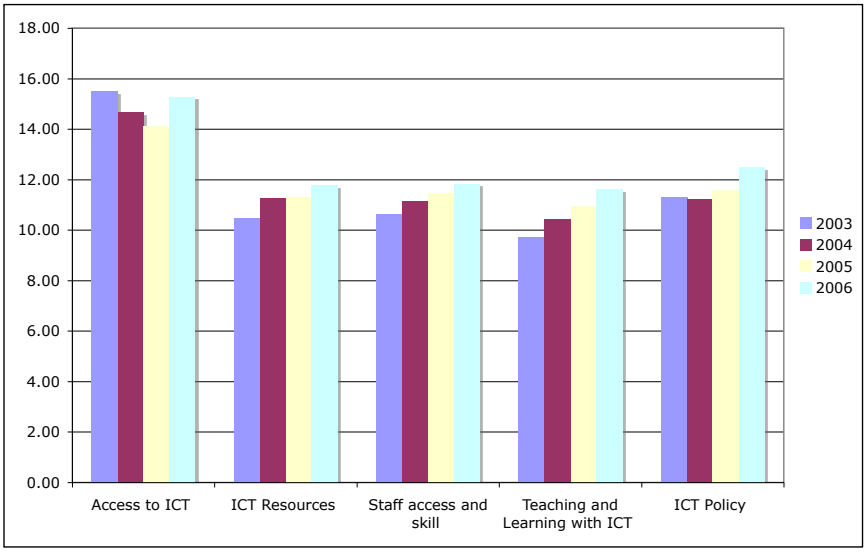
The Becta e-Maturity data shows an overall increase in scores on the aggregate of the 5 dimensions (referred to in the database as e-embeddedness). This is represented in Figure 2.

Figure 2, The average growth in e-Maturity 2003-06



Within this growth, the greatest increase is in reports of *Teaching and Learning* while in contrast the measure of *Access to It* shows a decrease. These data are shown in Figure 3.

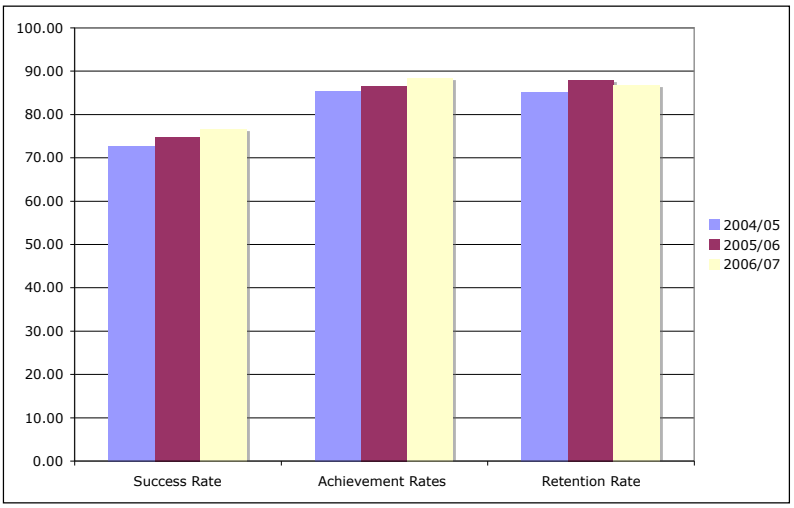
Figure 3, Change in reports of e-Maturity by year and by component



2.2. Achievement data

The achievement data show increases over the 3 years that are currently available and are shown below in Figure 4.

Figure 4, Change in achievement data over 3 years



2.3. Measurement

An important consideration in analysing this data is the quality of the measures. Measurement theory states that our observed score (O) is made up of two components, the true score (T) and the error score (e). This gives us the equation of,

O = T + e

When we consider our observed scores we have to make some estimate of the possible error in that score when we are estimating the underlying factor. In the case of the e-Maturity score, the indices that make up the overall score have been derived from a questionnaire that has changed each year. It is not clear whether the scales have been validated or how reliable they are. It is reasonable to assume that they provide an indication of perceived e-Maturity within a college but the tolerance of that measure might be quite wide. Anther issue

with the e-Maturity measure is that it is not clear who has filled in this measure and the grade and responsibilities of the respondent might vary from one college to another.

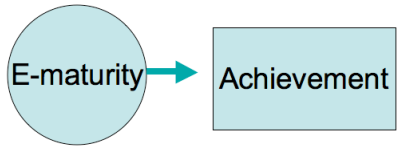
The achievement scores at first glance would offer a reliable and valid measure of output from the college, but as a comparison measure they have a number of sources of error. For example, the categorisation of courses in subject type varies from college to college. Also the nature of the measures means that there is very little variation between one college and another as many colleges approach ceiling scores on the output variables.

The Ofsted scores have been derived from an analysis of reports but the reports are not conducted on an annual basis and for most colleges there is only one report available over the 4 year period of the study.

2.4 Testing the data

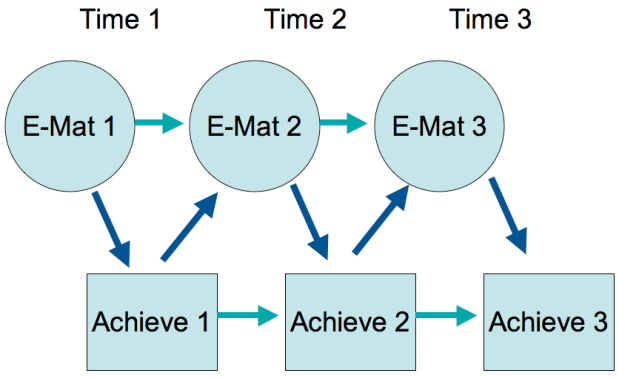
The main question to consider is whether there is a clear relationship between e-Maturity and achievement. The underlying main question is whether there is an impact of e-Maturity on performance and this is represented in Figure 5.

Figure 5, The basic model of impact of technology on achievement.



The current data allows us to map this proposed impact over time and there are several models that can be used to test this relationship. One of these models is shown below in Figure 6. This illustrates the hypothesis that e-Maturity will affect achievement which will itself feedback into e-Maturity and create a positive feedback cycle of development. This model was tested along with other possible models of interaction between time, e-Maturity and achievement. None of these models achieved a significant outcome.

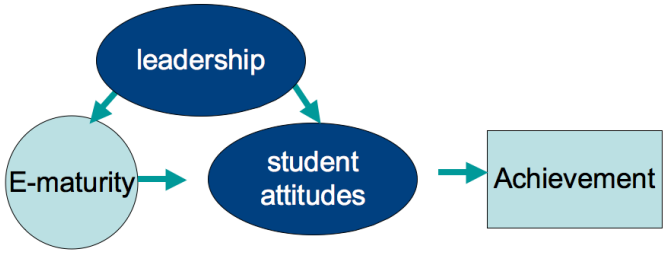
Figure 6, Exploratory model of the relationship between time, e-Maturity and achievement



Given previous research it is no surprise that we did not find a clear relationship between the key variables. The overall measures, however, might well hide some significant effects within their components. There are two ways to explore this, one is to look at the impact of the individual components or, for example, e-Maturity and the other is to look at the most and least e-Mature institutions.

Given the past research it is important to consider what other variables might affect the achievement scores and these might include college demographics, college leadership, student attitudes, etc. There are numerous models that could use these variables for example there might be an effect of college leadership on the student experience of the college and also the achievement scores (Figure 7). The challenge for future research is to clearly define the most important variables and to find valid and reliable measures of them.

Figure 7, Possible model of the impact of e-Maturity on achievement



3. Analyses of the impact of e-maturity on performance (all subjects)

The analysis was completed in four stages. First a range of inferential statistics were computed to assess the relationships between e-maturity (embeddedness) and the three outcome variables (Success Rate; Retention Rate; Achievement Rate) across each of the three time periods (2004/5; 2005/6; 2006/7). After this, associations between each of the outcome variables and each of the individual variables used to calculate the overall embeddedness score were calculated. It was expected that this series of calculations would reveal whether the individual components of e-maturity (embeddedness) displayed distinct associations with each of the outcome variables across the three time periods. The third stage of the analysis was conducted to compare colleges across each of the outcome variables and across each of the time periods based on their embeddedness rating. Of particular interest were outcome comparisons between high rating colleges (Upper 25%) and low rating colleges (Lower 25%). Finally analyses were employed to assess whether those colleges who graduated from low embeddedness at time one to higher embeddedness at times two or three (based on the classifications imposed at the third stage of analysis) achieved better outcome ratings at time three than the remaining colleges who displayed no growth.

3.1. Correlations between embedddedness variable and achievement variables

A series of correlational statistics were computed to assess the relationships between e-maturity/embeddedness score and the three college outcome variables across each of the three time periods. The overall embeddedness score was not significantly associated with any of the outcome variables during the second and third time periods (2005-2007). During the first time period however (2004/5) a higher overall embeddedness rating was associated with a higher retention rating although this was a weak association (r=0.13). To further explore associations between e-maturity and college outcome/achievement a second series of analyses were conducted, however, on this occasion each of the individual components of e-maturity (access to ICT; ICT resources; staff access and skill using ICT; teaching and learning using ICT; ICT policy) and reported annual student numbers (FTE) were utilised.

3.2. Correlations between individual e-maturity variables and achievement variables

2004/5: During this time period there were four significant but weak positive associations between the e-maturity variables and the outcome variables. Increased college-wide access to ICT was associated with higher success ratings (r=0.15) and higher retention levels

(r=0.14). Retention levels during this time period were also positively associated with existing ICT policy (r=0.16). Student numbers (FTE) in 2004/5 were significantly associated with teaching and learning using ICT (r=0.15) in that greater numbers corresponded positively with ICT teaching and learning. During this time period there was one significant negative association identified between staff access and skill using ICT and achievement ratings. This was also a weak association (r= -0.15).

2005/6: During the second time period there were two significant but weak positive associations between the e-maturity variables and the outcome variables. Student numbers (FTE) were positively correlated with ICT resources (r=0.19) while retention levels were associated with college-wide access to ICT (r=0.16). Three significant negative correlations were identified for this time period. Greater student numbers (FTE) were associated with lower achievement ratings (r= -0.18) and lower access to ICT (r=0.15) while teaching and learning with ICT was associated with lower success ratings (r=0.15).

2006/7: In the 2006/7 period there were two significant weak-to-moderate positive associations between the e-maturity variables and the outcome variables. Increased staff access and skill using ICT was associated with higher retention ratings (r=0.37) and increased teaching and learning using ICT was associated with higher achievement ratings (r=0.34). Conversely greater college-wide access to ICT was associated with lower achievement ratings (r= -0.33). Student numbers during this period were negatively associated with existent ICT policy (r= -0.45).

3.3. Comparisons between low e-mature and high e-mature colleges across achievement variables (Lower 25% versus Upper 25%)

The third stage of analysis was conducted to compare colleges across each of the outcome variables and across each of the time periods based on their embeddedness rating. Of particular interest were outcome comparisons between high rating colleges (Upper 25%) and low rating colleges (Lower 25%). It was expected that those colleges who achieved a higher embeddedness rating would display higher success, retention and achievement ratings than those colleges achieving a lower embeddedness rating. The upper and lower 25% of colleges in each time period according to their embeddedness rating was calculated. These classifications are displayed in table 3.

Table 3. Embeddedness rating upper and lower 25% cut-off-points for three time periods

	2004/5	**2005/6**	**2006/7**
Lower 25% Embedddedness Rating Cut-Off	53.08	55.08	57.08
Upper 25% Embedddedness Rating Cut-Off	64.58	65.25	69.50

Table 3 indicates that the 25% cut-off embeddedness ratings seem to increase from 2004 to 2005 and from 2005 to 2006. Colleges achieving ratings at or below the lower 25% cut-off-point were compared with colleges achieving ratings at or above the upper 25% cut-off-point on each of the three outcome variables across all three time periods. The mean success, retention and achievement ratings for each embeddedness group (lower and upper 25%) across each time period are displayed in Table 4.

Table 4. Mean success, retention and achievement ratings for each embeddedness group across each time period

	2004/5 Mean (SD)	**2005/6** Mean (SD)	**2006/7** Mean (SD)
Success Rating			
Upper 25% Embeddedness	76.48 (8.21)	86.88 (6.28)	89.25 (5.51)
Lower 25% Embeddedness	74.73 (7.38)	85.78 (4.21)	88.14 (7.32)
Retention Rating			

Upper 25% Embeddedness	75.36 (9.98)	87.11 (5.01)	87.38 (7.18)
Lower 25% Embeddedness	76.91 (7.53)	86.97 (5.16)	88.79 (4.37)
Achievement Rating			
Upper 25% Embeddedness	78.57 (6.11)	87.88 (4.06)	89.54 (3.66)
Lower 25% Embeddedness	75.87 (4.99)	86.37 (4.07)	88.13 (3.26)

Table 4 indicates that those colleges who attained an embeddedness rating within the top 25% achieved higher ratings in success, retention and achievement than those colleges attaining embeddedness ratings within the bottom 25% across each of the three time periods with two exceptions. Colleges within the lower 25% performed greater on retention ratings in the 2004/5 and the 2006/7 periods. None of these differences were statistically significant. Table 2 also indicates that the mean success ratings, retention ratings, and achievement ratings for both groups of colleges improved from one year to the next.

In the final stage of analysis comparisons were calculated between those colleges who graduated from a rating in the lower 25% of embeddedness to the upper 25% of embeddedness in the second or third time periods on each of the outcome variables at time three. It was expected that colleges who displayed growth in e-maturity would outperform colleges who displaying no such growth. The mean success, retention and achievement ratings for each embeddedness group (growth; no growth) at time three are displayed in Table 5.

Table 5. Mean success, retention and achievement ratings for each embeddedness-growth groupings at time three

	2006/7 Mean (SD)
Success Rating	
E-Growth Colleges	77.74 (7.20)
Non-Growth Colleges	77.28 (6.22)
Retention Rating	
E-Growth Colleges	87.22 (7.75)
Non-Growth Colleges	87.21 (4.35)
Achievement Rating	
E-Growth Colleges	89.54 (4.21)
Non-Growth Colleges	88.95 (4.07)

Table 5 indicates similar success and retention ratings for colleges who graduated from a low (bottom 25%) to a higher embeddedness rating across the three years and those colleges who sustained their embeddedness rating across the three year period. Colleges identified as having matured over time attained a higher achievement rating in 2006/7 than those colleges who had not. Again, these findings were not statistically different from one another.

4. Analyses of the impact of e-maturity on performance (selected subjects)

The analyses for selected subjects followed a similar pattern to that for all subjects. The chosen subject categories were ICT, Business and Life Skills. These were chosen to reflect a range of activities in colleges. The choice was restricted because of the varied interpretation of the categories across the sector and so the choice was made of subject categories with the least ambiguity. A range of inferential statistics were computed to assess the relationships between e-maturity (embeddedness) and the three outcome variables (Success Rate; Retention Rate; Achievement Rate) across each of the three time periods (2004/5; 2005/6; 2006/7). As above, the analyses went on to explore the impact of individual components of e-maturity on the outcome variables across the three time periods. Of particular interest were outcome comparisons between high rating colleges (Upper 25%) and low rating colleges (Lower 25%). Finally analyses were employed to assess whether those colleges who graduated from low embeddedness at time one to higher embeddedness at

times two or three achieved better outcome ratings at time three than the remaining colleges who displayed no growth.

The results for individual subject categories followed a similar pattern to those for the all-subject analysis. Each individual subject category showed a small number of weak associations with elements of e-maturity but there was no identifiable pattern and none of the associations reached a strength that would allow messages to be drawn for practice in the colleges. Likewise the analyses of the high and low rated colleges failed to find any significant differences between their performance on any of the outcome measures for any of the subject categories. Detail of the analyses can be found in the statistical appendix.

5. Analyses of the relationship between college type and e-maturity and performance outcomes.

The availability of information about college type allowed analyses to be carried out to see whether effects of e-maturity are greater in sixth form colleges rather than FE colleges, or in suburban colleges rather than inner city colleges or in different regions around the country.

5.1. Comparisons of the impacts of e-maturity on sixth form colleges and general and further education colleges.

As expected sixth form colleges out-perform general and further education colleges on all three outcome measures used in the analysis. Of more interest is the impact of e-maturity within these college types. The most noticeable and significant effect can be seen in the achievement data (see statistical appendix). In the general and further education colleges there is no measurable difference in achievement rates between the most and least e-mature colleges. In the sixth form colleges in 2006/07, however, there is a significant effect with achievement rates up by over 5% in the top 25% e-mature colleges.

5.2 Comparisons of the impacts of e-maturity on the colleges in different regions and of different geographical type

There are ten regions for the sector and the analyses found no measurable differences between them. Of interest is the comparison between the bottom and top 25% colleges as defined by their e-maturity scores (see data appendix). This shows the complexity of the relationship between e-maturity and performance in that for some regions the colleges with the least e-maturity out-perform the colleges with the highest e-maturity.

A further categorization of colleges was created in terms of their geographical location in terms of being rural, provincial, urban and inner city. Again this identified few differences except for the inner city colleges where the high e-mature colleges significantly out-performed the low e-mature colleges.

6. Analyses of the impact of e-maturity on performance at different levels of accreditation

The analyses for the level 1 and level 4 data were completed in five stages. First a range of inferential statistics were computed to assess the associations between e-maturity (embeddedness) and each of the level 1 and level 4 outcome variables across the three time periods (2004/5; 2005/6; 2006/7). After this associations between each of the outcome variables and each of the component variables of e-maturity were calculated for both levels across all time periods. The third stage of analysis was conducted to compare colleges across each of the level 1 and level 4 outcome variables and across each of the time periods based on their embeddedness rating. Of particular interest were comparisons between high rating colleges (Upper 25% of embeddedness score) and low rating colleges (Lower 25%). The fourth stage of analysis was conducted to assess whether those colleges who graduated from low embeddedness at time one to high embeddedness at times two or three (based on the classification imposed at the third stage of analysis) achieved better level 1 and level 4 outcome ratings at time three than the remaining colleges who displayed no growth. The fifth and final stage of analysis was conducted to assess whether those colleges who scored within the upper 25% of embeddedness across all three time periods performed better on the

level 1 and level 4 outcome variables than those colleges who did not maintain this elevated status.

6.1. Correlations between embeddedness variable and outcome variables across levels and time periods

A series of correlational statistics were computed to assess the relationships between e-maturity/embeddedness score and outcome scores for level 1 and level 4 across the three time points. The overall embeddedness score was not significantly associated with any of the level 1 or level 4 outcome variables during the second and third time periods (2005-2007). During the first time period however (2004/5) a higher overall embeddedness rating was associated with a higher achievement rating for level 1 although this was a very weak association (r = 0.04). To further explore associations between e-maturity and level 1 and level 4 outcome a second series of analyses were conducted, however on this occasion each of the individual components of e-maturity (access to ICT; ICT resources; staff access and skill using ICT; teaching and learning using ICT; ICT policy) were utilised.

6.2. Correlations between components of e-maturity and level outcome variables across time periods

2004/5: The correlations between the components of e-maturity and the level 1 and level 4 outcome variables for 2004/5 are displayed in Table 6 A negative correlation between ICT policy and achievement rating for level 4 was the only significant association although this was weak (r = -0.18).

Table 6 E-Mat components across Level 1 and Level 4 Outcome Variables 04/05

	Level 1			**Level 4**		
	Success	Retention	Achievement	Success	Retention	Achievement
ICT Resources	-.059	-.029	-.060	.047	.030	.040
Staff Access & Skill	.045	.059	.015	-.015	.069	-.060
Teach & Learning with ICT	.051	.004	.076	.003	.056	.004
ICT Policy	-.130	-.091	-.117	-.125	.018	-.177*

* = significant associations

2005/6: The correlations between the components of e-maturity and the level 1 and level 4 outcome variables for 2005/6 are displayed in Table 7. For level 1, access to ICT was significantly and positively associated with success and achievement ratings while ICT resources were negatively associated with retention ratings. For level 4 ICT resources were associated with success and achievement ratings; staff access and skill with ICT was associated with retention; and Teaching and learning with ICT was associated with success and achievement. Once again however these associations were statistically weak (0.16 - 0.23).

Table 7 E-Mat components across Level 1 and Level 4 Outcome Variables 05/06

	Level 1			**Level 4**		
	Success	Retention	Achievement	Success	Retention	Achievement
Access to ICT	.162*	.020	.236*	.086	.119	.074
ICT Resources	-.100	-.200*	.026	.165*	.015	.191*
Staff Access &	-.110	-.134	-.054	.073	.220*	-.047

Skill						
Teach & Learning with ICT	-.011	-.107	.082	.177*	.080	.177*
ICT Policy	-.116	-.129	-.064	.013	.113	-.041

* = significant associations

2006/7: The correlations between the components of e-maturity and the level 1 and level 4 outcome variables for 2006/7 are displayed in Table 8.There were no significant associations between the components of e-maturity and the outcome variables for level 1. For level 4 there were statistically significant and positive associations between teaching and learning with ICT success (r = 0.20) and achievement (r = 0.18) ratings.

Table 8 E-Mat components across Level 1 and Level 4 Outcome Variables 06/07

	Level 1			**Level 4**		
	Success	Retention	Achievement	Success	Retention	Achievement
Access to ICT	.070	.081	.021	.104	.037	.092
ICT Resources	.092	.032	.100	-.106	-.034	-.100
Staff Access & Skill	.088	-.030	.131	-.055	.083	-.130
Teach & Learning with ICT	.108	.065	.080	.198*	.095	.179*
ICT Policy	.060	-.038	.102	.045	.032	.032

* = significant associations

6.3. Comparisons between low e-mature and high e-mature colleges across time periods and outcome variables for level 1 and level 4

The third stage of analysis was conducted to compare colleges across each of the outcome variables for levels 1 and 4 and across each of the time periods based on their embeddedness rating. Of particular interest were comparisons between high rating colleges (Upper 25%) and low rating colleges (Lower 25%). It was expected that those colleges who achieved a higher embeddedness rating would display higher success, retention and achievement ratings than those colleges achieving a lower embeddedness rating. The upper and lower 25% of colleges in each time period according to their embeddedness rating was calculated.

There were no statistical differences between high and low rating colleges on any of the outcome variables for level 1 during the 2004-2005 or the 2006-2007 periods. During the 2005/6 time period however it was noted that low e-mature colleges (mean = 89.47) performed significantly better than high e-mature colleges (mean = 86.58) on retention ratings for level 1 ($t(77) = -2.18$; $p<.05$). There were no statistical differences between high and low rating colleges on any of the outcome variables for level 4 during any of the three time periods.

6.4. Comparisons between e-growth and non-e-growth and e-maintenance and non-e-maintenance colleges across outcome variables for level 1 and level 4

The fourth stage of analysis was conducted to assess whether those colleges who graduated from low embeddedness at time one to high embeddedness at times two or three (based on the classification imposed at the third stage of analysis) achieved better level 1 and level 4 outcome ratings at time three than the remaining colleges who displayed no growth. No

statistical differences were identified between e-growth and non-e-growth colleges for levels 1 or 4 across each of the outcome variables.

The fifth and final stage of analysis was conducted to assess whether those colleges that scored within the upper 25% of embeddedness across all three time periods performed better on the level 1 and level 4 outcome variables than those colleges who did not maintain this elevated status. No statistical differences were identified between e-maintenance and non-e-maintenance colleges for levels 1 or 4 across each of the outcome variables.

7. Analyses of the relationship between e-maturity and Ofsted reports

7.1. Correlations between Ofsted variables and e-maturity variables across time periods

To assess associations between the Ofsted variables (capacity to improve; achievement & standards; quality of provision; leadership & management; equality of opportunity) and the e-maturity variables (overall embeddedness rating; access to ICT; ICT resources; staff access and skill using ICT; teaching and learning using ICT; ICT policy) across the three time periods a series of correlational analyses were conducted.

2004/5: The findings from the analysis of the first time period (2004/5) are presented in Table 9. All Ofsted variables are significantly and negatively associated with the overall embeddedness, ICT resources and ICT policy ratings for this year (correlations range form -0.19 to -0.41). Only capacity to improve is associated with access to ICT (-0.23). All Ofsted variables are negatively associated with staff access and skill except the achievement and standards variable while achievement and standards and equality of opportunity are the only Ofsted variables associated with teaching and learning during this year (negative associations).

Table 9 OFSTED variables with overall e-maturity and components of e-maturity 04/05

	Embeddedness	Access to ICT	ICT Resources	Staff Access & Skill	Teach & Learn ICT	ICT Policy
Effectiveness of Provision	-.346*	-.129	-.296*	-.303*	-.165	-.334*
Capacity to Improve	-.409*	-.228*	-.350*	-.314*	-.178	-.384*
Achievement & Standards	-.308*	-.151	-.214*	-.172	-.189*	-.366*
Quality of Provision	-.353*	-.176	-.271*	-.337*	-.168	-.315*
Leadership & Management	-.357*	-.165	-.300*	-.269*	-.160	-.366*
Equality of Opportunity	-.391*	-.131	-.296*	-.407*	-.241*	-.338*

* = significant associations

2005/6: The findings from the analysis of the second time period (2005/6) are presented in Table 10. No significant associations were identified between any of the Ofsted variables and the e-maturity variables. There was however one exception. Achievement and standards for this year was significantly and negatively correlated with staff access and skill (r = -0.25).

Table 10 OFSTED variables with overall e-maturity and components of e-maturity 05/06

	Embeddedness	Access to ICT	ICT Resources	Staff Access & Skill	Teach & Learn ICT	ICT Policy
Effectiveness of Provision	-.034	.025	-.031	-.117	.072	-.026
Capacity to Improve	.012	.080	-.003	-.060	.070	-.008
Achievement & Standards	-.032	.090	.050	-.247*	.135	-.073
Quality of Provision	-.033	.016	-.009	-.118	.034	-.016
Leadership & Management	.003	.088	-.007	-.132	.104	-.001
Equality of Opportunity	-.054	.021	-.055	-.187	-.016	.050

* = significant associations

2006/7: The findings from the analysis of the third time period (2005/6) are presented in Table 11. The overall embeddedness variable was negatively associated with the capacity to improve, the achievement and standards, and the equality of opportunity variables. No significant associations were identified between the Ofsted variables and the access to ICT and ICT resource variables. All Ofsted variables correlated significantly and negatively with the staff access and skill with ICT variable (correlations ranged from 0.30 to 0.40). Teaching and learning was negatively associated with effectiveness of provision and achievement and standards while ICT policy was negatively associated with capacity to improve, achievement and standards, and equality of opportunity.

Table 11 OFSTED variables with overall e-maturity and components of e-maturity 06/07

	Embeddedness	Access to ICT	ICT Resources	Staff Access & Skill	Teach & Learn ICT	ICT Policy
Effectiveness of Provision	-.201	-.019	.056	-.334*	-.239*	-.201
Capacity to Improve	-.247*	-.138	.082	-.396*	-.142	-.275*
Achievement & Standards	-.339*	-.101	-.059	-.433*	-.278*	-.291*
Quality of Provision	-.109	.031	.198	-.303*	-.134	-.226
Leadership & Management	-.193	-.027	.078	-.362*	-.204	-.201
Equality of Opportunity	-.268*	.008	.038	-.359*	-.227	-.362*

* = significant associations

7.2. Correlations between Ofsted variables and overall outcome variables across time periods

To assess associations between the Ofsted variables and the overall outcome variables (success; achievement; retention) across the three time periods another series of correlational analyses were conducted.

2004/5: The findings from the analysis of the first time period (2004/5) are presented in Table 12. Most associations between the Ofsted and outcome variables were non-significant for this year. However equality of opportunity was negatively associated with success (r = -0.06) and positively associated with achievement (r = 0.05) while quality of provision was negatively correlated with retention rates (r = -0.25).

Table 12 OFSTED variables with outcome variables 04/05

	Success	Achievement	Retention
Effectiveness of Provision	-.153	-.021	-.186
Capacity to Improve	-.165	-.085	-.139
Achievement & Standards	-.094	-.001	-.122
Quality of Provision	-.141	.047	-.252*
Leadership & Management	-.123	.001	-.167
Equality of Opportunity	-.062*	.053*	-.143

* = significant associations

2005/6: The findings from the analysis of the second time period (2005/6) are presented in Table 13. The Ofsted variables were not significantly associated with the success or retention variables for this year. The achievement outcome variable in this period however was significantly associated with the Ofsted variables, effectiveness of provision (-0.15) and capacity to improve (-0.17).

Table 13 OFSTED variables with outcome variables 05/06

	Success	Achievement	Retention
Effectiveness of Provision	-.038	-.145*	.029
Capacity to Improve	-.068	-.166*	.007
Achievement & Standards	.034	-.045	.044
Quality of Provision	-.034	-.131	.015
Leadership & Management	-.077	-.172	-.006
Equality of Opportunity	-.111	-.221*	-.013

* = significant associations

2006/7: The findings from the analysis of the third time period (2006/7) are presented in Table 14. Table 14 indicates that all Ofsted variables were significantly associated with each of the three outcome variables in the 2006/7 period. All correlations were negative and ranged from -0.36 (equality of opportunity with achievement) to -0.69 (achievement and standards with success).

Table 14 OFSTED variables with outcome variables 06/07

	Success	Achievement	Retention
Effectiveness of Provision	-.588*	-.507*	-.504*
Capacity to Improve	-.580*	-.505*	-.495*

Achievement & Standards	-.687*	-.571*	-.607*
Quality of Provision	-.576*	-.476*	-.513*
Leadership & Management	-.603*	-.532*	-.504*
Equality of Opportunity	-.434*	-.362*	-.383*

* = significant associations

8. Conclusions

The project has collated and analysed a substantial amount of data concerning the performance of colleges and their use of ICT. This database will be a useful resource for individual colleges to asses their own performance against sector norms and also for Becta to track changes in performance over time.

At first inspection the results show very little impact of ICT on student achievements. This largely confirms similar studies in colleges both in this country and across Europe. There are two possible explanations of these data, first that there is in fact no academic benefit to embedding ICT in colleges, or alternatively that there are some benefits but we have not been able to find them. If we explore the second hypothesis then the reasons for not finding the effect might be

1. We should look at learner level data on variables such as engagement with learning and general responses to the learning provision. This may be captured by the student survey which we hope to add to the current database.

2. The measure of e-Maturity does not capture the actual level of embeddedness of ICT in the institution. The measure is completed by management and will reflect their experience possibly to the exclusion of the experiences of learners and teachers.

One interesting finding concerns the predictive value of the Ofsted reports. These results have to be taken with caution because the reports are not made each year and so we have only partial data. However, they suggest that over the three years of this analysis the Ofsted reports become better predictors of achievement in the colleges. Also there are some measurable and significant associations between e-maturity and Ofsted reports.

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10. Appendix: Variables in college spreadsheet

College Code
College Name
UPIN

Ofsted
Inspection Grade Cycle 1
Inspection Grade Cycle 2
Effectiveness of Provision
Capacity to improve
Achievement & Standards
Quality of Provision
Leadership & Management
Equality of opportunity

Total number of students 2003
Permanently employed 2003
Sessional staff (approximately) 2003

E-maturity 2003
Access to ICT 2003
ICT Resources 2003
Staff access and skill 2003
Teaching and Learning with ICT 2003
ICT Policy 2003
Index of e-embeddedness 2003

Total Funded FTE 2002/03

E-maturity 2005
Access to ICT 2005
ICT Resources 2005
Staff access and skill 2005
Teaching and Learning with ICT 2005
ICT Policy 2005
Index of e-embeddedness 2005

E-maturity 2006
Access to ICT 2006
ICT Resources 2006
Staff access and skill 2006
Teaching and Learning with ICT 2006
ICT Policy 2006
Index of e-embeddedness 2006

E-maturity 2004
Access to ICT 2004
ICT Resources 2004
Staff access and skill 2004
Teaching and Learning with ICT 2004
ICT Policy 2004

Index of e-embeddedness 2004

Achievement 2004/05
Starters (Excluding Transfers)
Success Rate
Achievement Rates (All Completers)
Retention Rate (completers only)
Retention Rate (inc continuers)
Achievement Rate (known outcomes)
Achievement Rates (Business, ICT, Preparation for Life)
Retention Rate (Business, ICT, Preparation for Life)
Achievement Rates (Levels 1 and 4)
Retention Rate (Levels 1 and 4)

2003/04 Total FE Funding Allocation (£)
Grand total FTE 2005

Achievement 2005/06
Starters (Excluding Transfers) Success Rate
Achievement Rates (All Completers)
Retention Rate (inc continuers)
Retention Rate (completers only)
Achievement Rate (known outcomes)
Achievement Rates (Business, ICT, Preparation for Life)
Retention Rate (Business, ICT, Preparation for Life)
Achievement Rates (Levels 1 and 4)
Retention Rate (Levels 1 and 4)

Grand total FTE 2006

Achievement 2006/07
Starters (Excluding Transfers)
Success Rate
Achievement Rates (All Completers)
Retention Rate (completers only
Retention Rate (inc continuers)
Achievement Rate (known outcomes)
Achievement Rates (Business, ICT, Preparation for Life)
Retention Rate (Business, ICT, Preparation for Life)
Achievement Rates (Levels 1 and 4)
Retention Rate (Levels 1 and 4)

Appendix 4

The example of A-Level Psychology

Appendix 4: The example of A-Level Psychology

The development of A-Level Psychology illustrates some strengths and weaknesses of the current system of assessment. Psychology only appeared on the school curriculum in the late 1960s and was restricted to a few test schools and colleges until the 1980s. Since then it has enjoyed a spectacular growth to become the 4th most popular choice at A-Level with around 100,000 students taking an AS course in the subject each year (Banyard, 2014). This growth has been demand led by students and is an illustration of the bottom up pressures on schools and colleges.

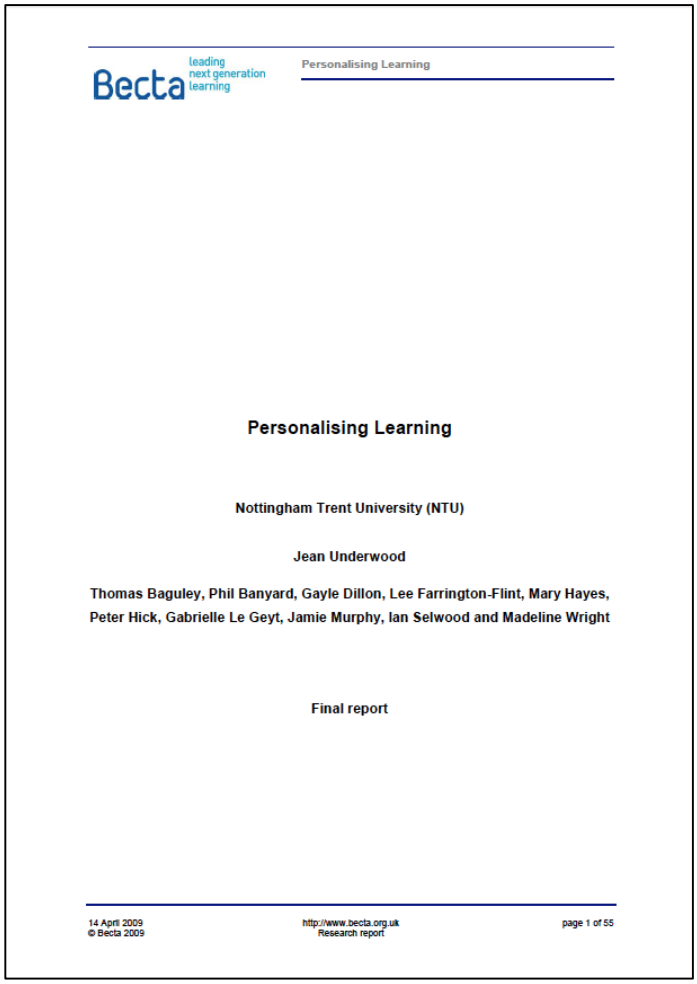
During the last 30 years of syllabus development there has been debate around how the structure of curriculum can affect learning. For example, the traditional way of structuring a syllabus under key headings with summaries of research findings given for each of these headings offers a top-down approach to learning. An alternative to this is to provide access to original sources and research ideas and encourage students to come to their own understandings and evaluations of this evidence (Banyard, 1993a, 1993b, Banyard & Grayson, 1999). In this way students are able to see how psychology is conducted and gain an understanding of the structure of knowledge in the subject. This approach was adopted by the GCSE in Psychology and then the AS and A-Level designed for the Oxford and Cambridge Schools Examination Board (now OCR).

The development of A-Level Psychology illustrates how curricula can be designed to facilitate a more learner-centred approach and how curriculum development can be driven by the bottom-up process of student demand (Banyard, 2008). It also illustrates the constraints placed on curricula through the demands of assessments that are driven by concerns about reliability and a desire to retain traditional, and dysfunctional, ways of examining performance (Banyard 2014). For example, these assessments require students to complete tasks that do not allow them to demonstrate the learning skills they employ when using digital technologies, and as such these assessments are a conservative break on the development of new technologies in education.

Despite, or because of, its popularity the subject is commonly portrayed in a negative way (for example as a soft option) by the press, politicians and some universities (Banyard, 2013). This is despite considerable evidence that the demand of the subject is equivalent to that of other A-Levels (Coe, et al., 2008; QCA, 2008). Also, students of A-Level Psychology report that it is more taxing though more interesting and relevant than their other A-Levels (Banyard & Duffy, 2014). Furthermore, an analysis of popular combinations of A Levels found that Psychology features in the top twenty combinations of subjects with, in particular, Biology and Chemistry, English Literature and History, and Biology and Maths (Rodeiro & Sutch, 2013).

Appendix 5

Underwood, J., Baguley, T., Banyard, P., Dillon, G., Farrington-Flint, L., Hayes, M., Hick, P., Le Geyt, G., Murphy, J. Selwood, I. & Wright, M. (2009). *Personalising learning.* Coventry: Final report for Becta.



Becta leading next generation learning

Personalising Learning

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Final report

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The researchers would like to acknowledge the co-operation and support of the staff and pupils of all schools whose work is the subject of this report (see Appendix A for a full list of participating schools).

1. Executive Summary

This report presents the findings of the Personalising Learning project, which was commissioned by Becta.

The core aim of the project is to develop a robust model of the effective use of digital technologies for the personalising of learning. Personalising Learning in this context involves the tailoring of pedagogy, curriculum and learning support to meet the needs and aspirations of individual learners irrespective of ability, culture or social status in order to nurture the unique talents of every pupil.

Section 2 of this report outlines the background and aims of this research project.

Section 3 traces the development of the model and the accompanying learning equation. The key concept encapsulated in this model is that of overlapping action spaces – school, teaching, personal and living spaces - in which learning occurs. These spaces are populated by the key educational stakeholders: learners, their teachers and their family and peers. In each of these spaces a range of digital technologies is available to support the learner.

Section 4 is a validation of the model using evidence from field research.

Personalising Learning

Personalising learning is understood in different ways by managers, teachers and learners. Our analyses confirm the fractured nature of different stakeholders' understanding of this core educational concept: while both staff and pupils may see the personalising of learning as good practice and a goal to be strived for, pupils often do not recognise staff efforts to deliver on this concept. This perceptual discontinuity can in part be explained by pupils equating personalisation with 'me time' but we also have evidence that some teachers, while accepting the personalisation agenda, are still operating a controlling model of education. Many teachers, however, equate personalising learning with pupil voice and choice. They also link this to the need for a curriculum that engages pupils and for many teachers this is not the National Curriculum.

The Process Model: The Learning Equation

1.1 Revisiting Impact 2007

A key output from the Impact 2007 study was the relationship between e-Maturity of the school, Investment in Learning (IinL) by the pupil and overall school performance on standardised tests. This finding was used to generate the Learning Equation, which states that level of opportunity plus investment predicts the effectiveness of learning undertaken in a school. The finding was based on 2006 performance data. Here we repeated the analysis using 2007 performance data and found that:

a. e-Maturity remained an important positive factor in school performance at Key Stage 2.

b. At GCSE level there was a tentative effect showing a potential relationship between learners' perception of personalisation and school performance. The robustness of these relationships will be tested using data at the individual pupil level under the Impact 2008 project.

1.2 From the Harnessing Technology Survey data provided by NFER

i. Teachers in secondary and special schools had similar attitudes, but teachers in primary schools were less likely to agree that ICT had a positive impact on personalising learning. While our own studies show partial support for this finding we also have evidence of primary staff expressing strong support for the use of technology for learning. These disparate findings illustrate the differences between evidence from best practice schools, where primary staff are enthusiastic users of the technology, and the more normative sample of the NFER survey.

ii. As length of service within the profession increased, positive attitudes to the value of ICT for the personalisation of learning decreased: that is, there is an inverse relationship between years of professional experience and teachers' positive perceptions of ICT for personalising learning.

iii. Teachers tended to be positive about use of ICT to provide personalised learning for older pupils (especially Key Stages 3 and 4) and for particular subgroups within a class. These sub-groups included pupils with special needs, and the gifted and talented. Interestingly boys and girls were seen to benefit to the same extent from their use of ICT.

iv. In schools where the senior management had made personalising of learning a priority, teachers were more likely to perceive the benefits of ICT in moving that agenda forward. This was the case for both new and established staff.

A Descriptive Model: The Model of Personalised Learning

1.3 The Learning Space

i. Both at school and at home:

   a. There was evidence of learners being given greater flexibility and autonomy over their learning through the use of online formative assessments and curriculum-based activities.

   b. It was apparent that to be effective, pupils need to recognise the relative importance of continuous formative assessments and feedback in helping them to set their own learning goals. That is they need to have the skills to effectively invest in their own learning.

   c. There has been a shift to supporting work more with visual and non-linguistic auditory media and away from spoken or written output.

   d. There has been a shift towards producing outputs that are broadcast beyond the confines of home or school.

ii. For many learners the out-of-school digital world is richly populated and the school digital world often suffers by comparison.

iii. Digital technology is at the centre of learners' experience of school and personal life. It is aspirational and functional, and is an important way of defining and expressing an individual's identity. However, learners engage

with digital technologies in ways that are only partially recognised and explored by schools.

iv. The mobile phone is ubiquitous at all ages but used little in school.

v. Social networking is central to the digital world of Key Stage 4 pupils but much less so for younger pupils.

vi. While some pupils sought to keep this digital life a private matter others expressed puzzlement as to why their teachers were not using social networking as a conduit to pupils.

vii. In various forms, gaming was also important to all aspects of these learners' personal and academic lives. This capacity to motivate has been harnessed by teachers in some schools.

1.4 The Teaching Space

i. The majority of teachers in this sample have taken on board the Personalising Learning agenda.

ii. Personalisation for these teachers was not perceived as a move to individual learning programmes. For some teachers it was a more global entity while for others individualisation was a logistical impossibility.

iii. Personalisation was seen as something that good teachers already do and have been discussing for decades.

iv. There is a distinction between those teachers who define personalisation by level of pupil choice and those who argue that choice must be an informed action on the part of the pupil.

v. In teachers' perceptions it is clear that ICT is strongly associated with Personalising Learning.

vi. Teachers clearly recognise the motivational attributes of digital technologies.

vii. There is evidence that digital technologies are transforming pedagogy beyond the confines of lessons through the use of ICT. An example of such activity is the use of the Question Wall as a discussion forum (*see page 38 of this document*).

viii. Teachers value technology that is used to provide formative feedback to pupils and parents, arguing that it not only aids informed choice but has a positive impact on pupil behaviours.

ix. A majority of the teachers felt that personalisation of learning is constrained by the National Curriculum. Personalising learning is restricted in light of rather rigid assessment formats. In particular teachers often felt that standardised exams do not fit in with the culture of autonomy over learning and personalisation.

x. The Digital Divide between learner and teacher remains a concern; teachers seek to adapt to the changing digital landscape, while their charges are immersed in this new world. The Divide will be difficult to eradicate given the pace of technological change. The younger generation

will always be at the forefront of technological adoption while their teachers, in general, will lag behind.

1.5 The Institutional Space

i. The development of e-Maturity across both sectors is strong.

ii. Schools have very disparate responses to learners' digital social networking. While no school operated a *laissez-faire* policy, some managed the activities while others operated a policy of containment or an outright ban on such activity.

iii. The use of technology to aid record keeping and assessment is increasingly embedded into practice and is a direct aid to the personalising of learning.

iv. There is a clear trend to provide a greater range of feedback to learners, teachers and parents. Such feedback encompasses behavioural as well as school performance measures.

v. The use of technology to inform learners, teachers and in some cases parents about a learner's progress through the school is now increasingly prevalent, although not yet ubiquitous. There are a range of ways in which this facility is provided.

vi. Digital technologies have made the boundaries between school and living space more permeable. There are mixed responses to this.

vii. The nature of digital storage and the transfer in and out of that store can have profound effects on the working methods of both the learner and the teacher. Although the storage of files at the school permits school-wide and personal access, the transfer of files using tools such as memory sticks and email remains problematic and this hinders remote access to files.

1.6 Outstanding Issues

i. The Digital Divide between teachers and learners and also parents and their children remains a reality.

ii. We have yet to develop a pedagogy of ICT use.

iii. We have yet to establish the value of learners' informal learning with digital technologies, including how do we capture the influence of such learning on formal education?

iv. How can we take educational advantage of the ubiquitous mobile phone?

v. To what extent should we be concerned about activities such as the use of social networking sites?

vi. To what extent should we be concerned about the level of monitoring of the learner that is now possible through technology?

vii. How do we maximise the benefits of home-school links through technology while reducing the negative impacts on equity and workloads of learners and teacher?

1.7 Messages for Policy Makers

i. Alignment:

   a. There is a need to create greater alignment between curriculum, assessment and pedagogy for the digital school.

   b. In order to bring curriculum, assessment and pedagogy into alignment there is a need to develop:

      - a pedagogy for digital technology usage;
      - assessments that better measure the shifts in learning activities that accompany effective use of digital technology;
      - assessments that clearly capture valuable informal learning of skills and knowledge, particularly those supported with and through digital technologies.

ii. Resourcing the e-Mature School:

   Resource levels in terms of hardware are a declining issue. The policy focus needs to move on to the provision of, and also access to, good quality content and to workforce development so as to take advantage of the new resources, particularly in terms of developing pedagogy.

iii. Monitoring of pupils with and through digital technologies.

   In order to maximise the potential benefits of monitoring while seeking to reduce less desirable effects there is a need to develop:

   a. Guidance for pupils to stimulate the effective use of the increased levels of feedback available with and through technology, to aid learners in self-regulating their learning.

   b. Clear guidelines on the monitoring of learners and the sharing of information.

iv. There is a need to identify the costs and benefits of increased home-school links for the developing child and also for disparate groups of learners, including the technology rich and poor.

v. In relation to mobile phones and social networking sites, there is a need to:

   a. Develop clear guidelines on the use of such technological innovations in order to maximise educational gain and to minimise unwanted outcomes.

   b. Establish whether the policy governing the use of such sites should be one of containment and protection or of enlightened exploration to produce an informed citizen.

c. Establish whether policy should be a national level or articulate the level of regional or local variations that can be tolerated within the system.

2. Outline of the Personalising Learning Project

How do schools successfully support the personalising of learning though the use of digital technologies? This research is part of an interlinked group of projects which include The Harnessing Technology Schools Survey, Becta Impact 2008 and Personalising Learning - The Learner Perspective. It also draws on the work undertaken for Impact 2007.

The Personalising Learning project was commissioned by Becta. The aims of this project were to first develop a model of the effective use of digital technologies for the personalising of learning and then to test the relevance of that model by capturing the rich picture of contextual inter-relationship of factors that create a school delivering the core personalisation agenda. This includes the depth of learners' knowledge of and skills in the use of innovative digital technologies.

2.1 Background

There are many ways that digital technologies can support the learner. In the Impact 2007 report (Underwood *et al*., 2008) we found two trends: the rise of the learner as not only recipient but also shaper of the educational experience, and the growth in the range and availability of user-centred, mobile digital technologies. The synergy between these two developments has the potential to extend the range of and access to learning experiences with the possibility of delivering the curriculum in more imaginative and flexible ways. However, digital technologies do not in and of themselves lead to a more personalised learning experience. Indeed Impact 2007 showed a complex relationship between the e-Maturity of a school and the degree to which a more personalised agenda was perceived by pupils to be operating in their schools. The teasing apart of this relationship is a core aim of the Impact 2008 project; also commissioned by Becta.

For the Department of Education and Skills (DfES, 2006),

> *"Personalisation is the key to tackling the persistent achievement gaps between different social and ethnic groups. It means a tailored education for every child and young person, that gives them strength in the basics, stretches their aspirations, and builds their life chances. It will create opportunity for every child, regardless of their background."*

This is not just a matter of readjustments to curricula or pedagogic practice, important though these maybe, but requires a shift in the social dynamics and practices of all partners including learners (see Pollard & James, 2004). Under this definition personalisation is a desirable state which should be available to all pupils, giving them a degree of autonomy and ownership of their learning but within the local and national educational framework from which core learning goals emerge.

The Gilbert Review of Teaching and Learning in 2020 (Gilbert *et al.*, 2006) took this further arguing that there is a need to ensure that personalised learning is a reality in every classroom and the report sets out a vision for how teaching and learning should develop between now and 2020. Thus the personalising agenda is about providing opportunities for the learner, which the latter may or may nor avail themselves of as was demonstrated in the Impact 2007 research (see Underwood *et*

al., 2008). While seemingly a rather passive view of personalisation, this conceptualisation does not preclude, and indeed would encourage, the development of learning environments in which learners can shape their experience of working in diverse locations, with diverse groups and cultures while monitoring their own learning.

Green *et al.* (2005) argue that the Gilbert Review vision and the challenges posed by the Personalising Learning agenda may prove difficult to meet without digital technologies as there will be a specific requirement for *"the communication, archiving and multimedia affordances of digital resources"* (Green *et al.,* 2005 p. 5). The need to identify and evaluate the role of digital technologies in supporting a more personalised learning experience is stimulated both by concerns about the performance of the current educational system but also an awareness that many learners today are already creating personalised learning environments for themselves outside school using digital resources. For most young people, technology is part of their daily lives. Those young people with access to digital technologies are already using these resources to tailor their informal learning to their own interests. However, we have consistently found some 10% of young people living in homes that are not technology enriched

A central goal of this Personalising Learning project is the provision of a rich picture of potentially significant factors that will allow the effective personalising of learning, with and through technologies, to take place.

2.2 Overarching Aims

The Personalising Learning project runs for six-months. This research has two overarching goals encapsulated in first a design and then a testing phase. Phase 1 focuses on model production and Phase 2 tests the model in a sample of e-Mature schools. A third Phase or activity, a further test of the model, requires the team at NTU to extend our analyses to the data captured under Becta Research 1: The Harnessing Technology Schools Survey. In detail the key goals were:

2.2.1 Phase 1: Design of the Model

In order to design the model presented here we have conducted a wide-ranging review of literature, projects and implementations to capture a picture of the current effective use of digital technologies for the personalising of learning. We have drawn on materials in the public domain as well as detailed classroom observations conducted under Impact 2007 (Underwood *et al*., 2008) and earlier work from the Broadband Project (Underwood *et al*., 2005).

2.2.2 Phase 2: Validating the Model

We have identified a corpus of 30 schools in which to test the validity of the model generated in Phase 1. The key outcome here is a robust dynamic empirical model of excellent practice that will adapt to new opportunities. We have also investigated how the projected plans of these schools do or do not fit the model, as this will indicate how the model may need to evolve overtime. We have used the data collected during the research to populate the model. The full model offers guidance on the facilitators and barriers to Personalising Learning through digital technologies.

In addition we have also questioned the model using a sub-set of the NFER Harnessing Technology Schools Survey (R1) data. Specifically we have conducted a

meta-level analysis of the data to identify underlying themes and patterns pertaining to the impact of high-quality personalised learning experience with digital technologies.

3. Phase 1: Developing a Model of the effective use of digital technologies for the personalising of learning

The model is expressed in two forms. Firstly as a description of the interrelationships between core actors (the institution, the staff and the learner) and the functional space which they inhabit (Figure 1). Secondly, a formal representation of those relationships is encapsulated in a core equation, with related sub-equations each of which are testable, given the availability of appropriate data (Figure 2). This equation stems directly from the research undertaken for Impact 2007.

A number of assumptions underpin this model:

i. The educational process is a dynamic system governed by a complex set of interrelationships.
ii. Learning occurs both in informal as well as formal settings and, after a period in the Twentieth Century when formal education dominated, the rise of digital learning spaces has rebalanced the importance of informal versus formal learning. Learners increasingly acquire not only 'street' knowledge but also 'academic' knowledge from outside of the classroom. In particular their technological world is likely to be richer outside the school than it is inside the school. As a result they have access to a range of resources and functionalities that allow for new ways of learning. These technological skills and new ways of learning can then be brought into the school and formal learning.
iii. Technological advancements such as simulations, virtual reality and multi-agent systems have been not only a stimulus but also a driver of a more flexible and social conceptualisation of learning. This is captured in the moves towards just-in-time learning, constructivism, student-centred and collaborative learning.
iv. A fourth assumption is that across the educational space there is the potential for children to take on multiple roles, which may include learner, mentor, tutor and in some cases assessor. Equally the teacher or tutor is also a learner in some contexts. While parents and guardians have their central role they are also tutors and learners. Each of these roles is important, as is evidenced from the Test Bed Project (Underwood, Dillon & Twining, 2007) where teachers' skills development was shown to be an important positive correlate of school performance. In contrast, Lim *et al.,* (2006) has reported reduced usage of technology by pupils in classes where the teacher was uncomfortable with technology.

This model is an overarching model of how the learning takes place – it might be viewed as subsuming more specific models such as that of Salmon's (2000, 2002) five-stage model of e-learning. Salmon charts how the learner becomes "acclimatised" to online environments with an emphasis on the interaction of the learner and the environment. The model presented here, however, steps away from such specifics. It is a predictive model which examines what the learner, teachers and significant others bring to the learning space and the nature of that space - whether formal or informal, virtual or real. The prime goal is to assess the impact of these multiple factors on the learning and behavioural outcomes.

3.1 The Descriptive Model

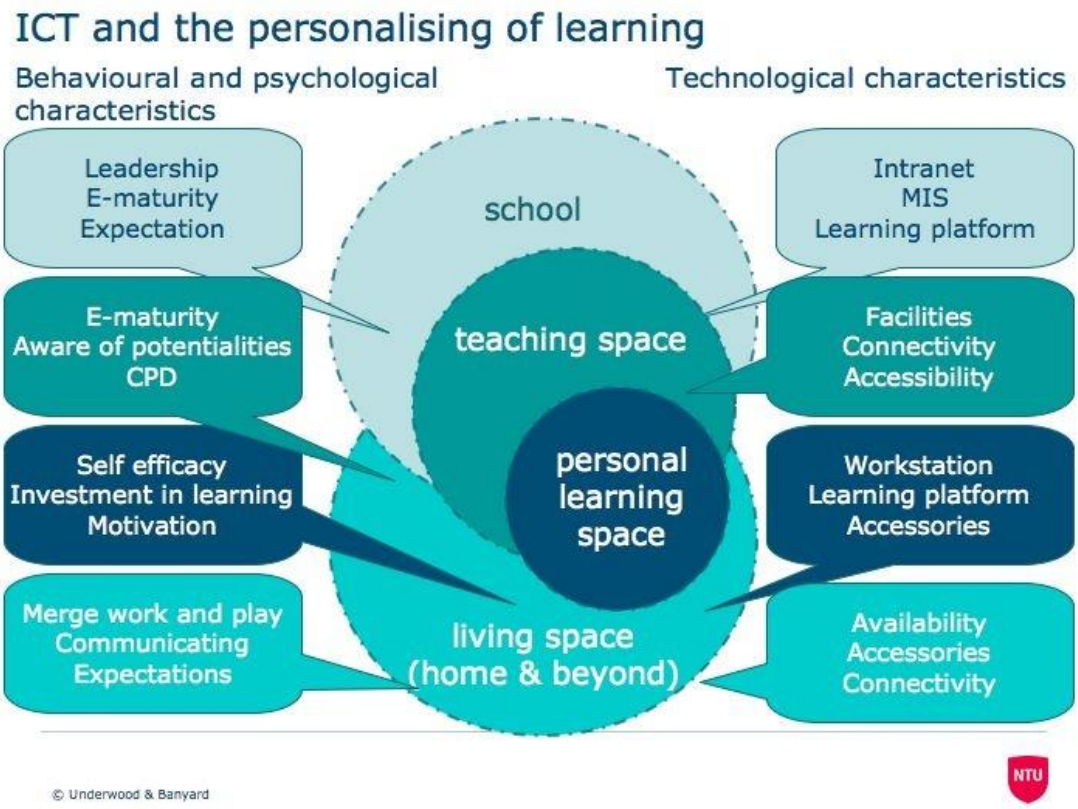
Returning to the Descriptive Model there have been three iterations to date. In the first iteration the nested model views the learners' experience as being structured by the teachers, who are themselves working with and contributing to the culture of the school. However, on reflection, it is more helpful to consider the *personal learning space* that the learner occupies rather than the learner himself or herself. Put simply, the personal learning space is the space in which learning takes place. This has some obvious physical characteristics but crucially it also refers to the cognitive space in which the learner operates. In the same way, it is helpful to consider the *teaching space* rather than the teacher. The teaching space includes the physical environment of the classroom and the cognitive structures that generate the learning environment.

In the third and current iteration of the Model (Figure 1) the space beyond the school also becomes significant. This *living space* provides a further input to the learning space and teaching space. Teachers create some of their teaching materials outside the school using resources that might not be available within the school. They might also belong to networks of teachers from other schools who are sharing good practice. Similarly, the learners' personal learning space is not limited to the school. They might have access to other technical resources and social resources outside the school.

The second level of description captures the characteristics of the participants and also of the technologies. In this sense the affordances of the technology introduce further enhancements, such as the capacity to support group dynamics.

The living space that most commonly provides support for learning is the home, but opportunities for learning go much further than this. With regard to the home, the affordances of digital technologies create a reciprocal traffic with the school so that just as the school can now be in the living room, the people in the living room can look into and affect the school. Digital technologies have helped blur distinctions between work and play and now with increasing links between school and home they are also blurring the distinctions between leisure and learning.

Figure 1: Model of Personalising of Learning



In the Model, the first level of description focuses on four educational spaces: the school environment including aspects such as culture and affluence of the institution; the teaching space; the personal learning space and the living space. While pupils as learners find a natural home in the personal learning space, the research evidence shows they are becoming more active in the teaching space. Teachers of course necessarily occupy the teaching space but they also occupy the learning space as they seek to develop their pedagogic and out-of-school skills. The Model clearly underscores the importance of out- of-school spaces both for the acts of teaching and learning and also for those pupils and teachers, or indeed parents, as learners. Some teachers also contribute to the school space in their leadership or technology roles.

At first glance the nested model of educational spaces hides a discontinuity. Are the spaces closed or open? How permeable are the barriers between the spaces? How much of the infrastructure and strategy developed at school level is appropriate to the needs of teachers in the learning space? How much of the structure of the learning space maps onto the understandings and skills of learners in their learning space? In previous research (Underwood *et al.* 2007) and in this current research the responses of managers, teachers and learners do not share the same perspective on the personalising of learning, although all groups acknowledge technology has an important role in supporting the personalisation agenda. Aligning the perceptions from the different spaces is key to the delivery of the Harnessing Technology agenda.

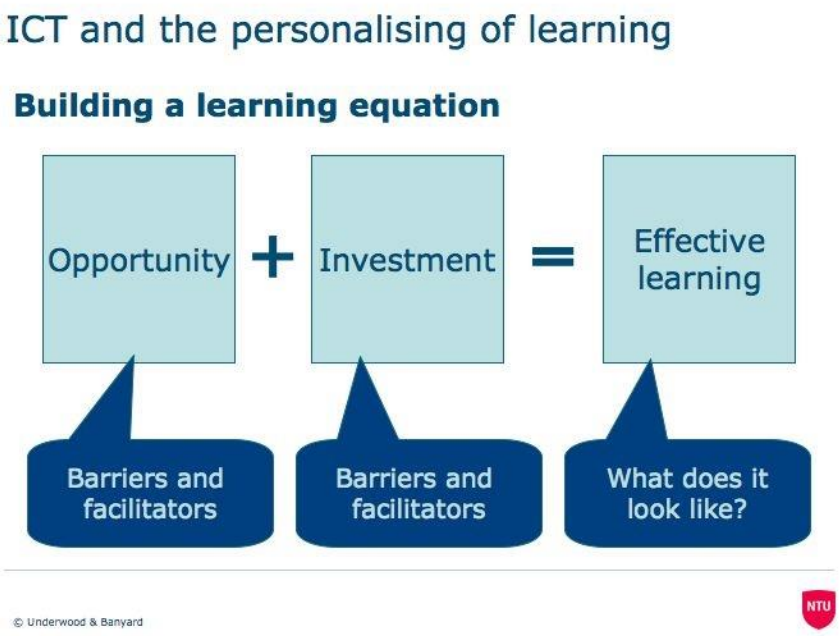
The second level of description captures the characteristics of the participants and also of the technologies. In this sense, the affordances of such technologies - for example their capacity to support group dynamics - create new opportunities for

influencing how learning takes places. At this level the model also captures the behavioural and psychological characteristics that are key to the delivery of personalised learning. Space in this model is partly defined by its physical characteristics and technical specifications. It is only fully understood by considering how people behave in that space and how they think about that space. A paved square can be a piazza if people are sitting at tables drinking coffee or it can be a parade ground if soldiers are marching on it.

3.2 The Learning Equation

The top level Learning Equation (Figure 2) emerged from the analyses undertaken for Impact 2007, which found links between e-Maturity and higher school performance, as well as greater IinL. Here, IinL was constructed from a range of factors including learners' work ethos, self-efficacy, motivation, engagement and overt behaviour. These two variables had a positive and additive effect on the school performance levels. Schools where pupils showed low IinL, performed less well on national tests than those where pupils were engaged with their learning.This finding was ameliorated by the level of e-Maturity. So schools, with high e-Maturity but low IinL outperfomed those schools with both low e-Maturity and low IinL. Schools with both high e-Maturity and high pupil IinL outperfomed fellow institutions on a range of national tests.

Figure 2: The Learning Equation

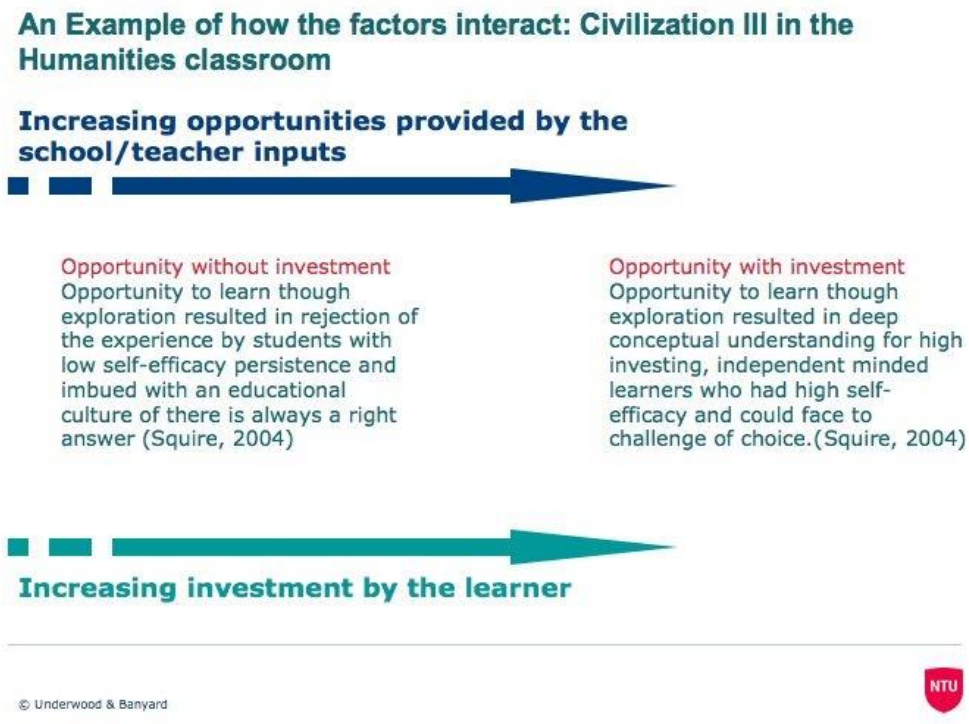


Our investgations into the impact of increased levels of Personalising Learning showed a more complex picture. Personalising Learning did not always relate to improved performance, particularly in high-performing schools. While personalisation did not necessarily require ICT, where the Personalising Learning agenda and well established e-Maturity occured together, there was a synergy which had beneficial

effects. However, the findings showed strong individual learner differences as well as the disparities between schools, indicating that some pupils were gaining greater benefits from the educational environment, for example from technology enrichment, than their peers.

So while e-Maturity, IinL and Personalising Learning have been shown to have a positive influence on performance and behaviour at school level, it cannot be assumed that this impact is the same for all pupils. In particular, the personalising of learning may be good for the majority but not for a significant minority of, for example, very able or very disaffected pupils. This finding is supported by the literature on the value of online role-playing games. Squire (2004) extended intervention using *Civilization III*, an historical simulation, resulting in a mixed reaction from US high school pupils. While 25% of the pupils (particularly academic underachievers) were highly motivated to learn history through the game, and considered the experience a highlight of their school year, a further 25% of pupils opted to go to the book club rather than make the mental effort required to engage with the game. Here, opportunity for a more interactive and personalised learning experience was rejected by pupils with low self-efficacy but eagerly assimilated by independent-minded learners (Figure 3).

Figure 3: Example of the interaction between opportunity and Investment in Learning



Kay and Knaack (2008) augment the argument against 'one size fits all' when considering responses to technology. They found significant individual differences in responses to learning objects or interactive web-based tools that enhance, amplify and guide the cognitive processes of the learner. From their sample of 850 secondary school pupils, those more comfortable with the technology appreciated it more although performance was unaffected; older pupils (year 12) were more postive

about the technology than their younger peers (years 9 and 10). Such differences across individuals and groups can result in conflicting findings which is why learner level data is so critical for the development of effective policies.

Impact 2008 has been commissioned by Becta to clarify the impact of increased personalising of learning. This report is due in autumn 2008. However, a lack of clarity about the '*nature and role of the personalisation when viewed from different stakeholder perspectives',* led us to exclude this factor from the top level equation (Figure 2).

3.3 Connecting the Descriptive Model and the Learning Equation

Each of the top level variables - both the independent (or predicative) variables, Opportunity and Investment, and the dependent variable, Effective Learning, can be further unpacked and linked to educational spaces, identified in the model. These spaces are identified as school, teaching space, learning space and living space.

Opportunity: What does it look like?

School level

- ICT available and accessible
- ICT integrated into the whole curriculum
- Increasing functionality, cohesion and sharing of records
- Increasing synergy between educational culture and ethos at home and school
- Increasing synergy between home and school resources particularly with regard to technology
- Digital divides researched and responded to

Teaching space

- Potentialities of ICT explored and developed
- Increasing differentiation of assessment to fit learner achievements
- Increasing choice of modes of working
- Increasing acceptance of the teacher and learner as active partners in the learning process.

Learning space

- Increasing learner input to the design of learning space
- Informal learning acknowledged and accredited
- Assessments developed that better accredit the learning taking place in the learning space[8]

Living space

- Increasing synergy between home and school educational culture and ethos

[8] The most common form of assessment is still a written test carried out using pen and paper or online but still using a similar format of questions. The learning in a personalised and technologically rich environment allows for the development of creativity, visual presentations, oral presentations, group work, multi-source research, drafting and editing, among many skills. These skills are not captured in the high-stakes tests and so much of the rich learning of the child remains unaccredited.

- Increasing synergy between home and school resources particularly with regard to technology
- Learning becomes seen as a central part of living

Investment: What does it look like?

Learner space

- COGNITIVE
  - Increasing skills of self-regulation
  - Challenge is embraced rather than avoided
  - Increasing effective working practices
- AFFECTIVE
  - Increasing acceptance of responsibility for their own learning
  - Learning is valued and sought after

Effective learning: What does it look like?

- Learners are engaged with their studies
- Learners are doing challenging but manageable tasks
- Achievement is valued and acknowledged by the learner and the teacher
- Learners are increasing their skills of critical thinking and problem solving
- Learners are developing skills of self-regulation
- Learning is transferable to other tasks
- Learning is relevant to the learner and their situation and personal learning goals

What is the outcome?

The outcome is a Virtuous Circle of increasing self-worth and engagement with the educational process leading to positive behaviours and improving educational performance.

4. Phase 2: Validating the Model

An array of both qualitative and quantitative data were used to validate the models

Phase 2 of the project required us to validate the model described above. We have endeavoured to do this in two ways. Firstly, by formally testing the assertions inherent in the model using standard statistical techniques, and secondly by evidencing the model using a range of qualitative and quantitative field data. Sources of data included a range of nationally-held information on a sample of nominally high e-Mature schools. In addition, we used survey, interview, focus group and observational data that tapped into the knowledge and perceptions of leaders, staff and pupils.

4.1 Collection of Field Data

Sample: Table 4.1 shows the distribution of the 30 sample schools by sector size and social advantage. All of the schools were initially deemed to be e-Mature although subsequent tests showed there was a wide range from moderate to very high e-Maturity. Social advantage was measured by the descriptor of the school location not by school catchment area and as such is a rough guide to school affluence. While the distribution of schools by sector and size is close to parity, we note that smaller secondary schools (fewer than a 1000 pupils) are overrepresented in socially disadvantaged areas while the schools in socially advantaged areas are almost all large (1000 pupils and more).

Table 4.1: Sample Schools by Sector, Size and Social Advantage

Characteristics	Primary Small <300 N=7	Primary Large 300+ N=8	Secondary Small <1000 N=8	Secondary Large 1000+ N=7
Socially advantaged	4	4	2	6
Socially disadvantaged	3	4	6	1

Unsurprisingly, there was a moderate correlation between the proportion of statemented children in any one primary school and the measure of social disadvantage (n=15; r=+0.55*; $p<0.05$*) but this did not hold for secondary schools (n=15; r=+0.11; *n.s.*). The discrepancy is probably due to the fact that the measure of social advantage based on school location is less sound when applied to the wider catchment areas of secondary schools.

At the secondary level there was a correlation between the proportion of statemented children in any school and absences from lessons (n=15; r=+0.67; $p<0.01$). While the primary schools showed a similar trend it was not statistically significant (n=15; r=+0.37; *n.s.*).

Research Instruments and procedures

Each of the schools provided access to the head teacher or a senior staff member, to the tutor in charge of ICT and also to one focus group of classroom teachers and at least one focus group of pupils (Key Stages 1, 2, 3, and 4). This provided responses from a maximum of 30 head teachers and ICT tutors and 150 classroom teachers. Pupil responses were more difficult to calculate but a guide of 5 pupils present in the target focus group and with two groups per school we have a projected target sample of 300 primary and 300 secondary pupils. Response rates are provided in Appendix B.

The contextual data relating to e-Maturity and personalising of learning required detailed responses from key members of each institution's staff, namely the head or member of the senior management team and the tutor responsible for ICT. For this we used an e-survey, the maturity model for heads and an ICT co-ordinator questionnaire. We conducted telephone or face-to-face interviews with each target individual as appropriate. These research instruments were essentially the same as those used for Impact 2007 (Underwood *et al.,* 2008) and so will not be discussed in full in this report. However, the use of focus groups was an innovation and requires a fuller description and justification.

The Focus Groups

The current generation of pupils is able to work with technologies in ways un-thought of by even their elder siblings. The Test Bed project has shown children as young as five years of age happily working with digital cameras and editing photos to produce their own web pages, while in the secondary sector pupils are producing home movies and composing and recording music (Underwood, Dillon & Twining, 2007). Further, communication has been transformed through the Internet giving rise to weblogs, YouTube, GoogleVideo, MySpace, Facebook and Bebo. As Green and Hannon (2007) point out, pupils are connecting, exchanging and creating in new ways; ways which their parents and teachers are certainly less adept and not always comfortable with (Banyard, Underwood, & Twiner, 2006).

A key question for this project is "How to capture the depth of learners' knowledge of and skills in their use of innovative digital technologies?" This information forms part of the richer picture of what the individual learner brings to the learning process.

The pupils' understanding of digital technologies was assessed by group categorisation of cards representing key examples of the technology (see Appendix D for details of the stimuli). This card sorting activity was a stimulus to a structured discussion involving both the pupils and the researcher.

4.2 Testing the Model

The Learning Equation developed under Impact 2007 was partially validated.

The NFER data showed some enthusiasm among teachers for personalising learning using ICT, but this was tempered by years of service and age phase.

4.2.1 Revisiting the Impact 2007 Data

As a first test of our models we elected to revisit the Impact 2007 primary school data and remodel the output using the 2007 Key Stage 2 and GCSE data. The purpose of this analysis was to establish whether the predictor variables of school performance, as evidenced in the Learning Equation (Figure 2) remained valid.

Within the constraints of the data it was established that the rate of change in Key Stage 2 school performance from 2006 to 2007 was predicted by e-Maturity (Beta = 0.41), giving an adjusted $R^2 = 0.21$ ($F_{3,22} = 3.20$; $p < 0.05$). This finding is a partial validation of the Learning Equation (Figure 2) and once again establishes the potential positive role of technology as a stimulus for school performance at primary level.

A similar analysis completed for secondary GCSE data was less revealing. Although the rate of change in school performance from 2006 to 2007 showed a weak trend for pupils' perception of personalisation and school performance ($r_{18=}0.368$; $p = 0.1$).

4.2.2 Testing the model through NFER Harnessing Technology Survey data

The *Harnessing Technology: School Survey 2008* is a large survey on the use and impact of ICT in schools. This analysis focussed on a small subset of these data most relevant to personalising learning. A more detailed description of the survey and the statistical modelling of the survey data may be found in Appendix C. The analysis reported here focuses on teacher attitude to the impact of ICT on personalising learning.

Overall attitudes to the impact of ICT on personalising learning were very positive. The impact was considered more positive for older children (particularly Key Stage 3 and 4 relative to Key Stage 1 and 2) and for selected subgroups of children: notably able, gifted or talented children and children with special educational needs.

Attitudes also varied somewhat between different categories of school. Teachers in special schools and secondary schools were more positive than those in primary schools.

The Impact 2007 (Underwood *et al.*, 2008) and early Test Bed (Somekh *et al*., 2004) data do show this greater variation across primary schools. However, by the end of the Test Bed (Underwood, Dillon & Twining, 2007) when primary teachers had become immersed in the project and for the Broadband project (Underwood *et al.,* 2005) which selected best practice schools, primary and secondary schools performed at a level. The disparity in these findings is a reflection of the samples. The NFER sample was non-selective but in the Test Bed and Broadband projects (Underwood *et al.,* 2004, 2005) data were drawn from best practice schools.

School priorities (identified in the *Harnessing Technology* School Leader questionnaire) also influenced teacher attitudes. Teachers in schools where personalising learning was identified as a high priority were more positive about the impact of ICT on personalising learning.

Attitudes also varied between teachers. Teachers with longer duration of professional experience had less positive attitudes than teachers in the early stages of their careers. However, it should be noted that even the least positive categories of

teacher (e.g., experienced primary school teachers) were much more likely to agree that ICT has a positive impact on personalising learning than to disagree.

4.3 Populating the Model

We turn now to an evaluation of our descriptive model of personalising learning which focuses on the interrelationships between behavioural and technology characteristics as they operate within identified activity spaces.

4.3.1 The Digital Space

> *Preference for generic versus content based software.*
>
> *Increased focus of multi-modality.*
>
> *Growing recognition that monitoring of the learner can provide feedback to the learner and the parent as well as to the teacher.*

We asked the teachers and pupils in our focus groups to identify the key software used in their schools. The teachers often interpreted this request as referring to the delivery medium, the virtual learning environment (VLE) or a podcast, rather than as a request to identify specific software *per se*. Nevertheless some interesting patterns emerged.

Both primary and secondary respondents - teachers and pupils - referred to greater variety of generic as compared to specific software. While this does not necessarily equate to overall levels of use, particularly when considering large-scale programmes of work for mathematics, the pattern of general tool as opposed to specific content support does appear to be a reliable finding. Named content software was largely focused on mathematics and to a lesser extent on English and a modern foreign language, however, content was acquired through generic tools also. The use of educational repositories in the form of the VLE or commercial resources in part explains the seeming lack of content software.

Predictably, and as has been the pattern for ICT over the last few years, software for word processing, drawing and data handling form the basic toolkit. However, a new trend of support for a wider range of sensory modalities is clear at both primary and secondary level. For example, natural language (modality) is being conveyed through diverse media (text or the spoken word) encouraging auditory and visual development through multi-modal outputs such as presentational software. While there are differences in the packages across the age range, the focus on story boarding, digital images both still and moving, all linked to sound is a shift in student skills and outputs. The concepts of presenting, publishing or broadcasting to an audience is a corollary of this development, as is demonstrated by a number of our schools' websites. The move to podcasts, blogs and wikis, particularly at secondary level is an extension of these activities. While this has been taken up with enthusiasm in some schools there are those who are resistant to these uses of the technology. A resistance confirmed in the interim report Harnessing Technology 2008 Survey (Smith & Rudd, 2008).

A final interesting pattern to emerge is the use of software providing feedback. Smith and Rudd (2008) found some 60% of their sample of teachers used technology for assessment and the findings here are not dissimilar. Feedback to teachers through record keeping and monitoring software, essentially the Management Information System (MIS), was widespread but in a number of cases feedback to pupils, and in a few cases to parents, was also available. Such feedback is part of the move from giving pupils choice to ensuring that that decisions and actions are based on informed choice. This use of the technology was largely a secondary phenomenon, as was the use of software to gather parental and pupil views on matters related to the operation of any one school.

4.3.2 The Learner Space

Learners at KS1 have a rich experience of technology.

Social networking is central to the world of KS3 and KS4 learners.

Key Stage 4 learners are using technology to communicate, broadcast and express their identity.

Learners see their homes as the main source of technological opportunities.

Large variation is experienced in the privacy and security policies of schools.

Learners show sophisticated awareness of technology and its potentialities.

An analysis of the responses from the learner focus groups is presented in this section. In total 82 focus groups were conducted and reported on (17, 22, 23, 20 at Key Stages 1, 2, 3, 4 respectively; see Table 4.2). The focus group activities included a brief questionnaire, card sorting tasks and group discussion.

Table 4.2: Number of focus groups completing each sort by Key Stage

	KS 1	KS 2	All Prim	KS 3	KS 4	All Sec
Free Sort	15	22	37	23	20	43
Favourites Sort	4	10	14	7	6	13
Frequency Sort	5	6	11	3	9	12
Where Used Sort	6	6	12	5	5	10

Card Sorting: While all focus groups conducted a free sort with the pupils selecting how to group the cards, fewer pupils re-sorted the cards using specified categories

such as *'Sort by location of use – Home, Home & School, School.'* The following analysis collates a summary of these data.

The card sorts included 33 cards but subsequent analysis identified cards that were redundant or did not provide a consistent response from the focus groups. Skype, Virtual World, Snapfish, 4oD, World of Warcraft, and the Scanner were excluded and these were removed from further analyses accordingly. Additional items also emerged from the student questionnaires and responses to some free sorts as salient to the pupils' technological world. Three such items (CBeebies, Club Penguin and Miniclip Games) have been added to the analysis to reflect the responses of the learners and a further item has been changed (Bebo replaced Facebook) as the more salient social networking site among the sample.

A cluster analysis revealed that some items were frequently grouped together in the free sorts. For example, children often created the category "Phones" in the free sort and included in this category the Camera Phone, PDA and SMS Messaging. Therefore, these common items were merged together to create a new item encompassing the functionalities of the individuals. This gave a revised list of 23 items in the sort analyses (Appendix D).

The technological world of the learner

Data were used from the card sorts of favourites and of frequency of use, and the questionnaire responses to develop a representation of the technological world of the child. It was evident that we could make a distinction between items that were an important feature of learners' lives, items that were used and items that were recognised. The Kappa analysis of frequencies of use showed that there was a measure of agreement in pupils' use of technology at both primary and secondary level. However, that agreement is weak at primary level. We suggest this reflects the tendency for some Key Stage 1 and 2 pupils to respond positively if they have simply heard of the item whereas others proved to be more discriminating.[9]

These analyses were used to populate Figure 4, which represents the digital world of the learner. The centre of each ellipsis represents the centre of the learner's digital world and the outer layers represent less important aspects of that world. The items outside of the ellipsis are either never used by the pupils, or they lack awareness of them. Ellipses were created for each Key Stage to demonstrate the technological transition through the Key Stages.

At Key Stage 1 learners are already very familiar with a wide range of technology and have experience of it at home and at school. At the centre of their world are games, television and, perhaps less obviously, a simple social network facility. However, messaging and communicating through digital means are outside the world of these learners entirely.

At Key Stage 2 there is an evident step change as technology becomes more important and more used. The learners are starting to have regular access to portable devices such as laptops and handheld games and they are using the

[9] Primary frequency sort: $k(N = 23, k = 11, m = 3) = .15, z = 6.75, p < 0.001$

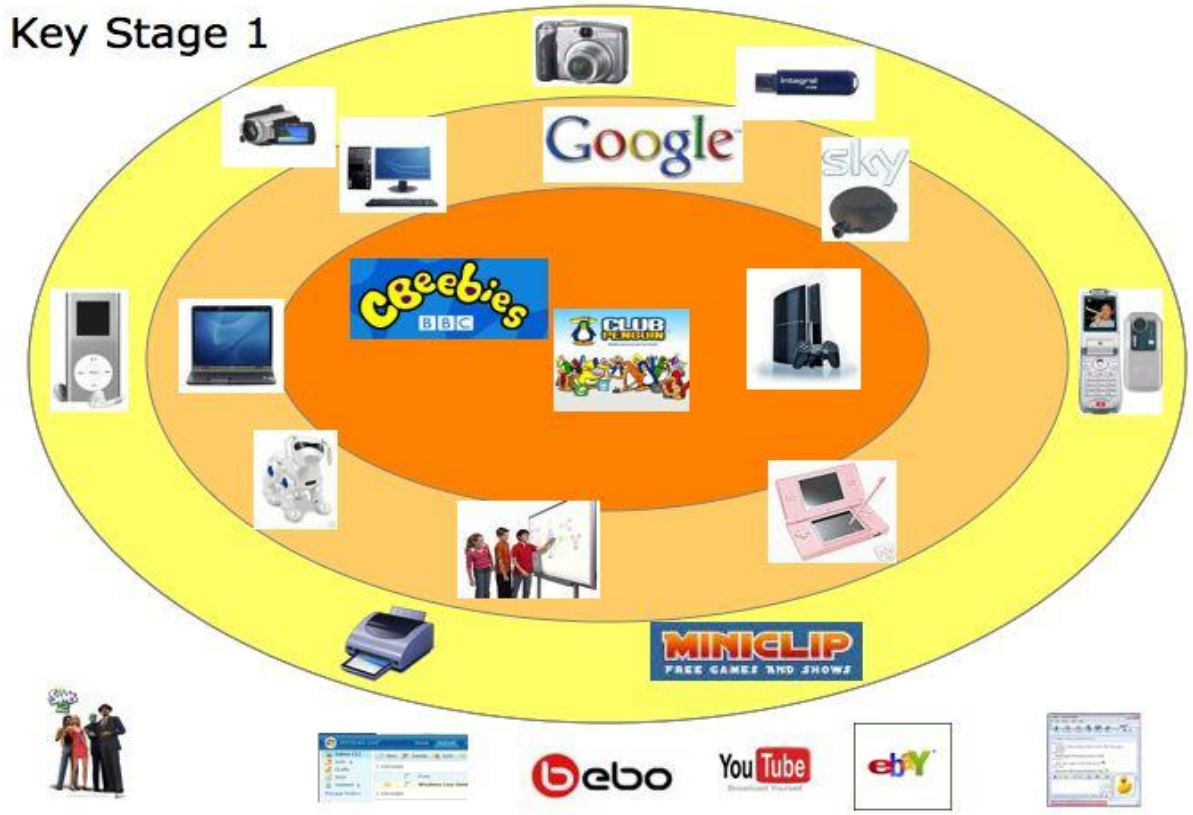
Secondary frequency sort: $k(N = 23, k = 12, m = 3) = .25, z = 9.63, p < 0.001$

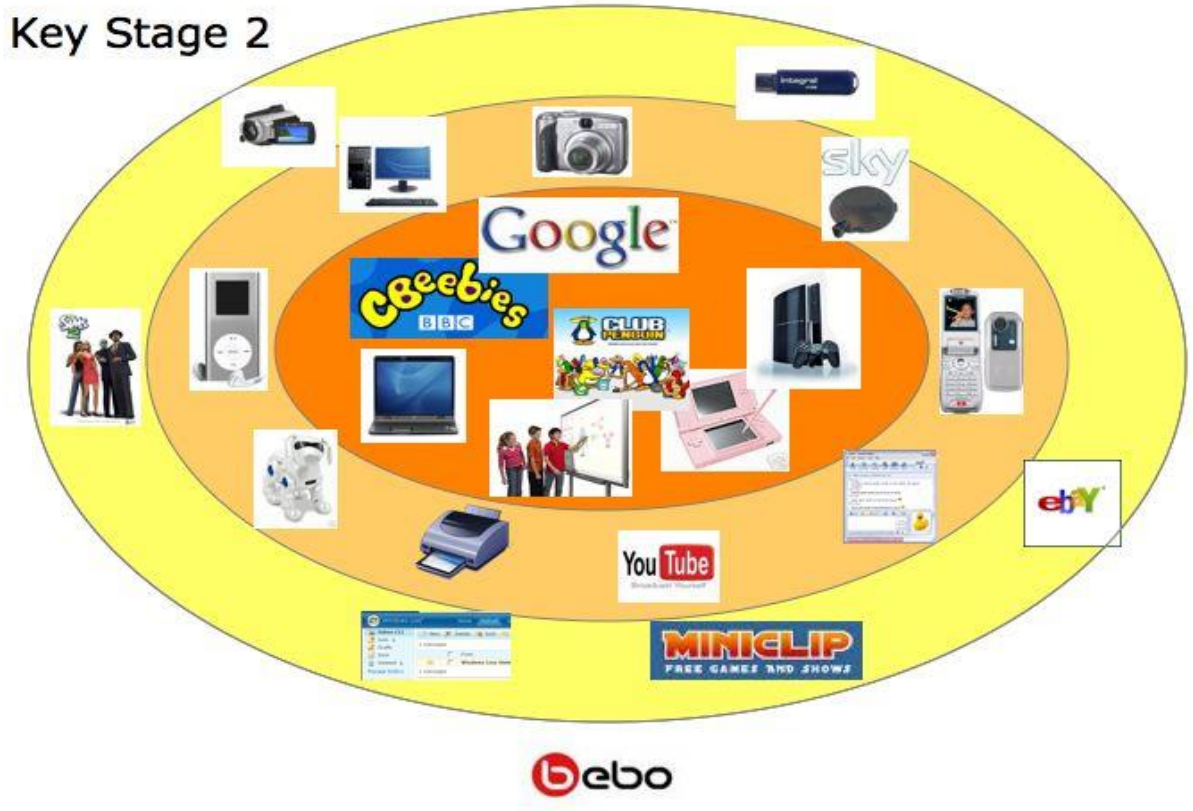
facilities to respond to their own agendas through search engines such as Google. Social networking is still limited at this stage.

At Key Stage 3 the simple networking facility is replaced by the more open sites such as Bebo, and CBeebies is replaced by general television channels. The console based games slip from their central position. The most striking change, however, is the central position for instant messaging.

By Key Stage 4 the learner is immersed in a rich technological world. At the centre of this world are the communication facilities, and pupils described how at home they keep open screens to instant messaging, social networking and email sites while at the same time texting their friends. Ownership of the devices and use of the facilities are used as expressions of identity. The technology is an important part in the development of independent and private lives for these learners.

Figure 4: The digital world of the learner at Key Stage 1 to 4





Key Stage 3

Key Stage 4

The digital spaces of home and school

Further analyses of the card sorts and the other responses allowed us to represent the learner's experience of school and home. Kappa analysis of frequencies of use showed that there was a measure of agreement in pupils' use of technology at both primary and secondary level[10].

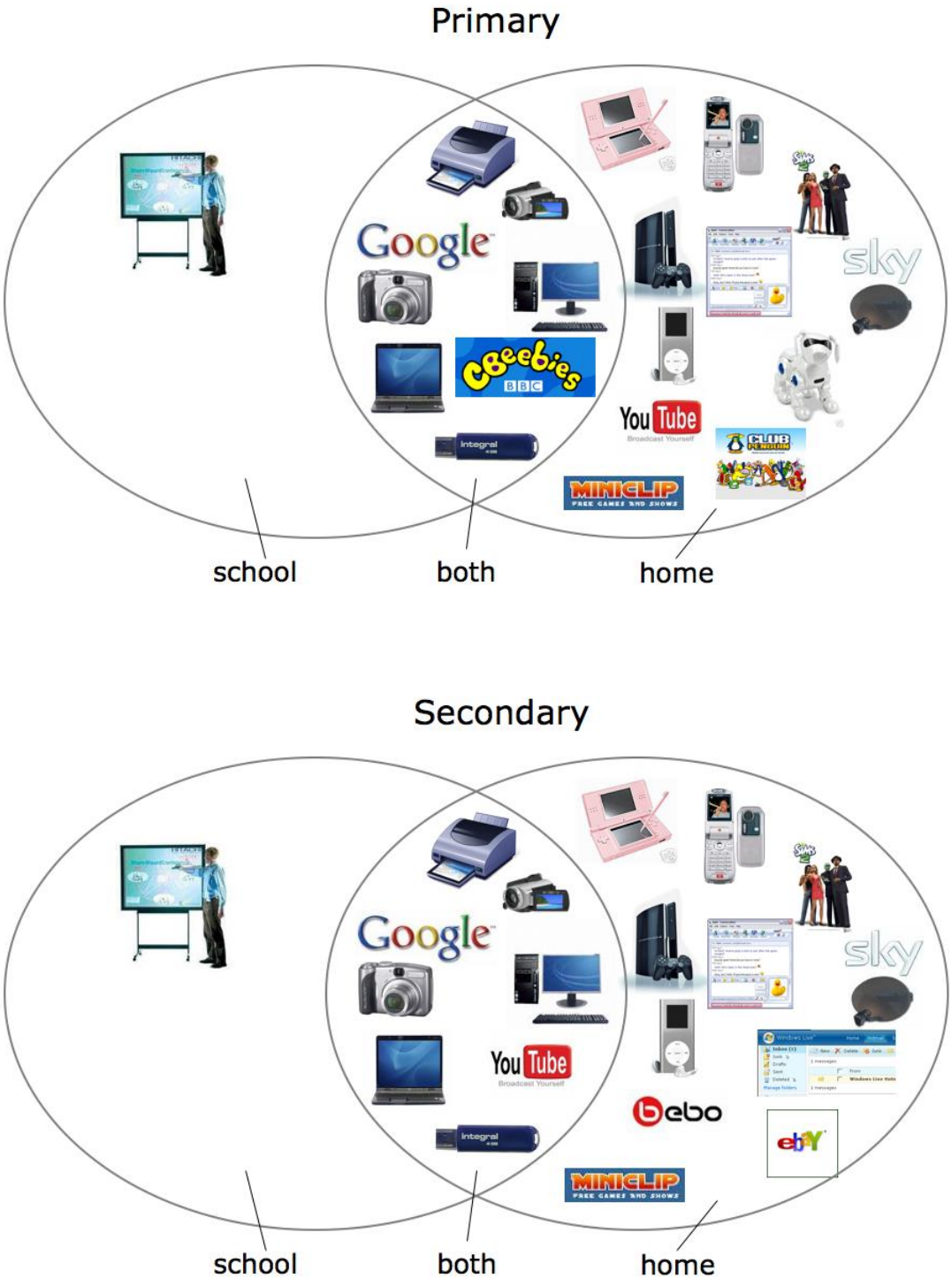
These analyses were used to populate Figure 5 which represents the digital world of the learner. Items that were rarely or never used were excluded from the analysis.

While we found differences in technology use at primary and secondary level (Figure 4) there were few differences between the two age groups when discussing where the ICT sits within the overlapping home and school spaces. This shows that the younger children had a similar awareness of digital technologies, although they selected not to be involved with such activities as digital social networking. In both cases, their technological worlds are rich. There is a similar overlap at both ages between home and school, though it was clear from comments in the focus groups that many learners believed they had access to better specification kit at home than they did at school. The main reading from this data is that learners see their homes as the main source of technological opportunities. One caveat to this finding is that the fieldworkers did not explore access to specialised educational software and devices such as specialist music and science equipment, which may have been found in a number of the schools.

[10] Primary where sort: k(N = 23, k = 12, m = 4) = .41, z =9.46, p < .001

Secondary where sort: k(N = 23, k = 10, m = 4) = .55, z =10.19, p < .001

Figure 5: Home and school digital spaces



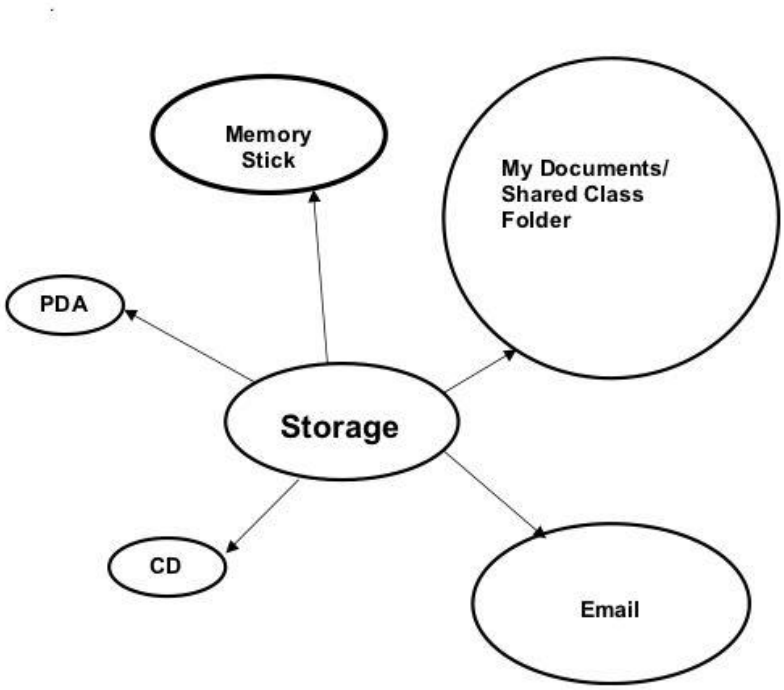
The Technology Walkthrough

In addition to student focus groups, pupils' use of school PC's was demonstrated to the researcher during a technology walkthrough. Pupils were asked to log on to a school PC, then to show the researcher what they would usually do once logged on.

Prompt questions and extra questions were provided if needed. Of the pupils that took part in the technology walkthrough, 11 provided responses to the prompt questions, 4 of these also responded to the extra questions.

Pupils were first asked where they store their work when they have used ICT in class. Both primary and secondary pupils identified “My Documents” or a shared class folder on their PC’s hard drive as the most common storage space, followed by memory sticks, email, and, to a lesser extent CD’s and PDAs. A common theme emerging from this data was that pupils in Key Stage 3 and 4 were more often given a personal user name and password for more secure storage, whereas the younger pupils shared communal PC space. Some pupils mentioned that they use a memory stick, but were not allowed to use them at school (see Figure 6).

Figure 6: How Learners Store their Digital Outputs



Pupils were asked about access to resources, in particular the software/ website resources they can access at school and at home. Communication applications were blocked in most schools including MSN Messenger, Facebook, MySpace, Hotmail and “websites with message boards”. Other blocked websites and applications included games and music websites, YouTube and some Internet searches. One student reported that an educational website was blocked at her school (www.coolmath4kids.com). Pupils were able to access most resources at home if they had Internet access, however some pupils reported that they could not access their class folder at home and one reported a languages activity programme that they used at school was not available from home.

The pupils here reported a similar range of software as those reported by the focus groups (section 4.3.1) but they also went on to report the websites they visited most often at school. Responses commonly included educational websites such as the school's website along with more commercial websites (www.learnthings.co.uk, Google, www.mymaths.co.uk, www.linguascope.com, BBC Schools, www.headlinehistory.co.uk), and communications/social networking websites (Facebook, MySpace, MSN Messenger, Bebo, chatrooms).

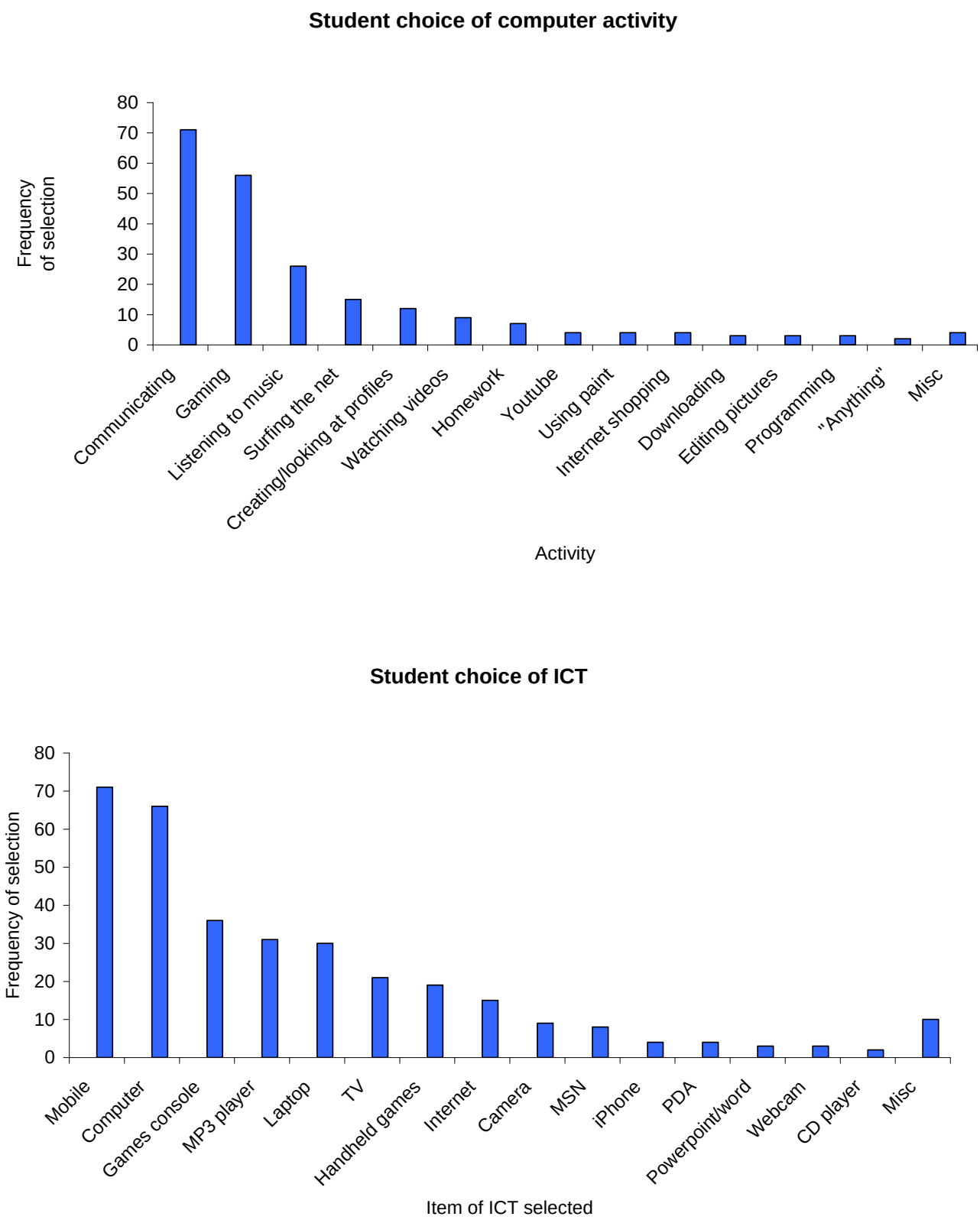
The three groups who responded to the question; does your teacher tell you how to do your work, indicated that teacher involvement was limited to suggestions about software to use. One secondary group responded that most of the time they worked independently. There was a mixed response to whether there was choice of learning tools with two groups indicating they selected whether to use digital or traditional tools but one reported that no choice was allowed and that pen and paper was the norm. Two groups of pupils indicated that were allowed to hand in work electronically or on paper, with one of these able to do an online test with immediate feedback. The remaining two groups were not given a choice and had to hand in a print out of their work, or hand in their homework book.

Some pupils were given the opportunity to show their best work on their school website, but this depended on accessibility. Otherwise it was displayed in their books.

ICT as a part of identity

We explored the uses pupils made of technology and which pieces of ICT were vital in their lives (Figures 7). In the former case we asked what activities they undertook using digital technology and in the latter case pupils were asked to name up to three pieces of technology that were their 'must haves'. Pupils were very astute and often chose multi-function hardware such as a mobile phone with camera to ensure all their needs were met. The two graphs together show that leisure activities take pride of place. Social networking, accessing music and to a lesser extent videos, gaming and surfing the net are integral to pupils' lives and are supported by key technology such as their mobile phone, computer and game playing machines. The use of technology to support their schoolwork did feature but was less apparent than leisure activities.

Figure 7: Linking Technology and Activity in Learners' Digital Worlds.



Even primary aged students seemed aware that their time with technology offered an avenue to independence, with an opportunity to develop their secret (or independent) lives. There were several comments about sites that their parents or teachers would not know about or maybe understand. The unknowingness of adults seemed to be amusing or embarrassing to them.

The Savvy Students and Empowered Citizens

The argument that the younger generation must be rescued from the clutches of digital technologies is loudly voiced and while there are worrying examples of abuse and misuse of technology, are pupils really in need of being rescued? For many working in the field there is a growing acceptance that, as Southwell and Doyle (2004) have argued the answer cannot be a simple yes or no. While Becta's CitizenCard Voice 2007 Cardholder (learner) Survey (Becta internal report) provides disturbing evidence of the net generation being overly cavalier with personal data, there are *savvy pupils* with a full understanding of the importance of protecting data. This was evident in discussions with a mixed group of year 9 pupils.

> *"These pupils had a good understanding of some of the issues relating to Internet use, citing for example, inherent dangers in using social networking sites like Facebook in comparison to using MSN messenger, which they all seemed to use regularly. They were fully aware that such sites were not private and their details could be accessed by unfamiliar adults, which they found threatening. They also recognised the potential for cyber bullying and the possibility of their identity being compromised now and in the future. MSN messenger was a preferred method of contact outside school as it is a direct and exclusive link between you and the person you had invited to chat with you. Whilst there were no gender differences in pupils' overt response to Facebook, both boys and girls were aware of the issues hence chose not to use Facebook; however it was the girls who were most concerned and who felt most vulnerable."* (*Secondary, Key Stage 3*)

This awareness raises pupils to the level of discerning consumers rather than naïve victims; this was also apparent in some pupils' attitudes toward their data files. Across the focus groups a number of pupils identified their data stick as a 'must have' tool. Their reasons for this were generally pragmatic; the stick allowed ease of transfer between home and school, so was great for homework, and file sharing between friends.

> *"However, one Year 9 pupil pointed out that he favoured the data stick because 'school can't steal it' –'it' in this case being his data. He could bring material to and from school without it being tracked, thus maintaining his privacy and independence. This made the data stick preferable to the VLE, which had echoes of 'big brother' in this young man's eyes." (Secondary, Key Stage 3)*

4.3.3 The Teaching space

Teachers have taken on board the Personalising Learning agenda.

Teachers perceive ICT as strongly associated with Personalising Learning.

Digital technologies are transforming pedagogy beyond lessons with ICT.

Personalisation of learning is constrained by the National Curriculum.

The digital divide between learners and teachers is problematic.

The Personalising of Learning: what does it mean?

Preliminary data analyses confirms the fractured nature of the understanding of this core educational concept; while both staff and pupils may see personalisation of learning as good practice and a goal to be strived for, pupils often do not recognise staff efforts to deliver on this concept. This perceptual discontinuity can in part be explained by pupils equating personalisation with 'me time' but we also have evidence that some teachers, while accepting the personalisation agenda, are still operating a controlling model of education.

That said many of our teachers equated personalisation with pupil voice and choice. They also linked this to the need for a curriculum that engaged pupils and for many this was not the National Curriculum.

> *"The teachers were particularly clear that personalisation was not individualisation – targeting every child's individual needs because this is unrealistic. It's a more rounded approach." (Primary, school wide)*

> *"Personalisation was seen as something that good teachers had been actively involved in for decades. The key issues are meeting individual needs and offering differentiated learning programmes. The problem with the rhetoric around Personalising Learning is that it implies that each child should have an individual learning programme and this is not possible in a class of 35 children." (Primary, school wide)*

> *"This is a whole school approach: all staff need to be on board and have ownership and understanding of the philosophy and ethos to ensure continuity, consistency and progression throughout the school. The importance of giving children ownership and independence over their learning including reflective practices, tracking learning and working within purposeful learning environments. We should value children's' theories by planning from their questioning. We work collaboratively in teams to ensure that all staff and children reach their full potential. We develop our practices*

so that they reflect our philosophy in terms of standards, independence and behaviour." (Primary, school wide)

"P-learning is a two way process (between student and teacher), not something you can just 'do to kids', they have to be involved in it too." (Secondary, school wide)

"Needs to be student led more than teacher led. Teacher has an idea of where they want the student to go, but leave choices and decisions of what they need to know to the children." (Secondary, school wide)

While the NFER Pilot Omnibus Survey – June 2007 indicated that there was a greater probability of members of senior management focusing on the need to engage learners through technology than their staff, in these e-Mature schools, staff were very aware of the need for such engagement. This awareness is demonstrated by the growing use of technology not only to provide pupil choice but to ensure that choices made are informed (refer to Section 4.3.1).

How might the technology help?

Digital technology was seen as a central support for a more personalised learning experience but the nature of that support can differ greatly. At the start of one teacher focus group discussion at a large secondary school a teacher began by proposing an analogy that the others debated. He suggested that Personalising Learning was like a canteen – there are many choices that have already been prepared, and there are a few rules about choice, but it is possible to select from anywhere to create a personal meal. The others in his group argued that you could do that in a library and ICT was more powerful than just choice or even differentiation. They agreed that diagnostic activities were important to the personalisation process; the pupils have to do the activities, the teachers mark the outcomes, and tell them what to do next.

For some schools the technology is being used to provide detailed feedback to pupils, staff and parents. Such feedback, not just on academic performance but also behaviour, supports pupils in their attempts to self-regulate their learning:

At one secondary school SAM Learning and 'P by P' (personalisation by pieces) schemes foster group activities, independent learning and encourages pupils to present and discuss work in a positive way. The "P by P scheme" is fairly new but allows pupils to set their own goals, find evidence to build skill sets and are assessed by mentors and other peers (2 years above them) from other parts of the country." (Secondary, school wide)

The motivational power of technology is clearly recognised by teachers:

"ICT enthuses and excites children; electronic tasks seem more exciting and stimulating in many cases. Although a good mix of computer activities and practical activities works best."

Class 1 pupils had the choice of 5 activities which used different methods to teach the children how to sound individual phonemes (e.g. 'U' & 'M'). 4/5 of these activities used technology to reinforce learning and to make it fun and varied (not rote learning).

- *PCs and Practice: - The area was like a circuit course for the children to rotate and change activities when they liked. Technology therefore, was being used to provide a variety of learning opportunities within a multisensory learning environment. The diversity appeared to sustain interest among the class 1 pupils and the choice of activities allowed the children to practice the areas most needed (e.g. letter identification/ tracing /sounding).*
- *Interactive White Board: - use of a pointer to select colours and trace a large letter 'U' so as to familiarize themselves with the shape of the letter for writing. They can alter the width of the line to challenge their accuracy and animation and song ('u-u-u-umbrella') was also used.*
- *Remote control car: once the child has successfully sounded a wooden letter, they match it to the written letter by driving it there in a remote control car.*
- *RM Tablets: playing on an Internet game, if a target letter appears (e.g. one being learnt that lesson) the student touches the letter with the pointer and a well-done message appears (underwater scene) (Primary, Key Stage 1)*

The potential for technology to motivate and maintain interest was recognised at a second primary school:

"The teachers all felt that much of the children's work was better when a smartboard was used for teaching. They reported higher motivation and levels of interest. They gave examples of individual children such as L, who usually needed extension activities to stretch him, easily done on a computer. Using a computer gave the opportunity of presenting one idea in a wide variety of ways, this way the teachers were able to ensure practice without the children feeling that they were doing the same thing every time." (Primary, Key Stage 1)

However, other schools use the technology in a more communal way as in this next example:

"The school uses software called 'question wall' which is used outside of lessons to support understanding. For example, in a project on religion a question wall was set up on which pupils can pose questions, answer other peoples' questions, share resources etc. Teachers monitor it and also pose additional questions." (Secondary, school wide)

Virtual Learning Environments

A detailed analysis of the use of VLEs within the sample schools will be addressed in the upcoming Impact 2008 report. The main finding from the data here is that although VLE development is in its infancy, this technology is seen as central to the personalising of learning. Indeed some perceptions of the potential of the VLE, to reduce workloads for example, are worryingly positive.

A corollary of the stage of VLE development revealed that many sites have very restricted content. This issue was reduced in those schools with a strong senior management commitment to the development of the VLE.

There were concerns about equity related to VLE access in the home.

Personalising of Learning and the National Curriculum

For some schools the National Curriculum is antithetical to the personalising of learning agenda.

> "*The National Curriculum needs to be more flexible and engaging in order to achieve p-learning. The national curriculum causes problems with this (individualised learning and differentiation) however – personalisation needs pupils to be engaged and this not always happening with the curriculum as it is presently. Further, the National Curriculum is very prescriptive in its outline and does not always allow teachers to be creative. Needs to be more flexible." (Secondary, school wide)*
>
> *"[You have] got to give pupils something they want to learn – not all pupils want to follow a traditional academic route, they become disengaged. Curriculum needs to be relevant. Education is such a holistic process that it is difficult to pick out one thing that will make a difference, everything needs to move at the same time." (Secondary, school wide)*

4.3.4 The Institutional Space

Development of e-Maturity in schools is strong.

Technology to aid record keeping and assessment is increasingly embedded into practice.

Schools are looking to provide a greater range of feedback to learners, teachers and parents.

Digital technologies have made the boundaries between school and living space more permeable.

Digital storage and transfer are problematic.

Inculcating Discerning Consumers

Many pupils, it emerges from the learner data, may be described as digitally savvy. Are these savvy pupils simply street wise, collecting their knowledge from the world beyond the classroom or is there evidence of schools aiding the development of the critical analysis exhibited here? Both in the Descriptive Model (Figure1) and in the Learning Equation (Figure 2) it was argued that the culture, ethos or vision of a school would be an important predictor of educational outcomes. Is there evidence to support this argument? In the case of the student rejecting the VLE because of its 'big brother' connotations, it seems unlikely that the school has impacted on him in a positive way. The school operates a full digital monitoring programme with lesson-by-lesson registration and rapid feedback to parents. This pupil sought to reduce the school's data collection on his activities and in this sense we might call him street wise. However, there are schools whose vision and practice have a clear focus on the development of not only the discerning consumer but also the discerning citizen.

The pupils who so ably articulated their rejection of Facebook are drawn from a school (secondary: socially disadvantaged) whose policy is one of openness, particularly in regard to the Internet and digital technologies in general. In the focus group, teachers at this school expressed the need for pupils to be exposed to both the ills as well as the joys of surfing the net while, they the staff, could provide a positive context in which to debate issues. *(Secondary, school wide)*

In a second school (secondary: socially advantaged) which operated a similar monitoring system, the pupils viewed this surveillance with equanimity and not as an infringement of liberty. However, in this school pupils were allowed considerable freedom in their use of digital tools, as exemplified by the school by-passing the local RBC controls to give pupils exposure to the wider Internet. *(Secondary, school wide)*

A third school (primary: socially advantaged) has extended this sense of openness in that it declares itself as a school without rules. Pupils here choose their own learning pathways and modes of working. The pupils have learnt to take responsibility from a very young age. The school is successful on all objective measures and the children here are empowered and empowering. *(Primary, school wide)*

A number of schools however, operated a policy of containment where social networking software was concerned. These schools are in the majority here, a finding mirrored in the Harnessing Technology 2008 Survey, which showed that "software was not overly encouraged by teachers in supporting pupils with their learning" (Smith & Rudd, 2008, p.30).

4.4 In Summary

- The data collected here provide a partial validation of the Learning Equation and of the Personalising of Learning Model. Both will be further developed under Impact 2008.
- Managers, teachers and learners understand personalising learning in different ways. Our analyses confirm the fractured nature of different

stakeholders' understanding of this core educational concept: while both staff and pupils may see the personalising of learning as good practice and a goal to be strived for, pupils often do not recognise staff efforts to deliver on this concept. Pupils equating personalisation with 'me time' can in part explain this perceptual discontinuity but we also have evidence that some teachers, while accepting the personalisation agenda, are still operating a controlling model of education. Many teachers, however, equate personalising learning with pupil voice and choice. They also link this to the need for a curriculum that engages pupils and for many teachers this is not the National Curriculum.

- ICT can provide opportunities for developing the personalising agenda but it can also provide the illusion of individual learning while actually restricting innovative work.
- As in previous studies there are concerns about home-school links which can be encapsulated first under work-life balance (when do the youngest children get to play?) and secondly, equity issues. Although, in this sample of schools, pupils in socially disadvantaged areas who, it was anticipated, would be technologically disadvantaged, still had high access to technology.
- The digital world is the norm for pupils, even those of a very young age, and this is not always recognised by teachers. It is aspirational and functional, and is an important way of defining and expressing an individual's identity. However, learners engage with digital technologies in ways that are only partially recognised and explored by schools. Schools have very different responses to this digital world. Some schools have policies of containment while others seek to engage with pupils and through these burgeoning technologies.

5. Outstanding Issues

1. The Digital Divide between teachers and pupils remains a reality. It can be argued that this is a transient problem which will disappear as a new, more e-Mature generation of teachers takes its place in the classroom. However, new technologies continue to evolve and change rapidly and early adopters and innovators will continue to be over-represented in children and young and under-represented in adults.
2. The Digital Divide between children and parents: can children be the drivers of ICT literacy and skills for the general population? Can we see children as a resource for the delivery of educational aims for the wider community?
3. We have yet to develop a pedagogy of ICT use. In this case direct intervention in the training of the workforce will be necessary.
4. What value should we place on learners' informal learning with digital technologies and if we value it, how do we capture the impacts of such learning?
5. For the younger generation the mobile phone is a ubiquitous technology. How can we exploit this for educational gain while reducing negative impacts of this technology in classrooms?
6. To what extent should we be concerned about activities such as the use of social networking sites?
7. To what extent should we be concerned about the level of monitoring of the learner that is now possible through technology?
8. While increased home/school links through technology are generally seen positively, they throw up two disparate issues; one of equity of provision and one of increased workload for both learners and teachers. Exploiting the flexibility while managing the demands arising out of the use of the technology is a critical issue.

6. Messages for Policy Makers

1. Alignment

   There is a need to create greater alignment between curriculum, assessment and pedagogy for the digital school. Wood (2006) has argued that the misalignment of assessment and an ICT rich educational experience requires radically new approaches to assessment. McClusky (2005) argues that many schools do not grasp the importance of ICT for assessment and therefore holistic change. Contrary to this, the e-Mature schools within this sample demonstrated that teachers had a very real awareness of what the technology could deliver but were frustrated by the current curricula and assessments.

   In order to bring curriculum, assessment and pedagogy into alignment there is a need to develop:

   - a pedagogy for digital technology usage;
   - Assessments that better measure the shifts in learning activities that accompany effective use of digital technology. For example, what form of assessment best captures the move from essay to story boarding or the rise in visual as opposed to verbal presentational skill?
   - Assessments that clearly capture valuable informal learning of skills and knowledge, particularly those supported with and through digital technologies.

2. Resourcing the e-Mature School

   While the resource cycle needs to be maintained, schools are generally rich in both hardware and software resources but there is evidence that the technology is not always used to best effect.

   To increase the effective use of the technology:

   - Barriers to good quality content need to be addressed. These barriers include not only the design of content but also copyright issues, costs of licenses and the level of filtering operating across the school system.
   - There is also a pressing need to deliver the Harnessing Technology agenda to facilitate management change and to provide appropriate and extensive CPD for teachers. This is particularly true for primary schools. While staff here were often very innovative in their use of ICT, there does appear to be a higher proportion of staff who do not see the value of technology as a support for personalising learning.

3. Monitoring of pupils with and through digital technologies

   As with many technological interventions there are clear benefits but potential pitfalls in the increased ease and therefore level of monitoring that is afforded by technology. While quality just-in-time feedback to both pupils and teachers is seen as a way to encourage informed choice and improve performance and behaviour, a less positive impact of such monitoring emerged in concerns voiced by pupils, parents and teachers about civil liberties.

In order to maximise the potential benefits of monitoring while seeking to reduce less desirable effects there is a need to develop:

- guidance for pupils to stimulate the effective use of the increased levels of feedback available with and through technology, to aid learners in self-regulating their learning;
- Clear guidelines on the monitoring of pupils and the sharing of information.

4. There is a need to identify the costs and benefits for disparate groups of learners of increased home-school links.
5. In relation to social networking, and other sites considered by some to be controversial, there is a need to evaluate any benefits for learning within a child protection framework. While being aware of the issues surrounding the use of these technologies by the young, recognition of both the motivational capacity but also the opportunities for learning afforded by the technologies should be part of our thinking. The clear question is; “How do we use these technologies to benefit the pupil?” In each case a risk analysis is essential but that analysis should clearly articulate the benefits, as well as the costs, and establish mechanisms to ameliorate identified costs or risks.

   There is a need to:

   - Develop clear guidelines on the use of technologies such as mobile phones and activities such a digital social networking in order to maximise educational gain and minimise unwanted outcomes;
   - Establish whether the policy governing the use of such sites should be one of containment and protection or of enlightened exploration to produce an informed citizen?
   - Establish whether the policy should be at a national level or whether regional or local variations are acceptable. If regional or local policies are acceptable then what level of variation will the system tolerate?

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Appendix A: List of Participating Schools

We would like to thank all the schools for their contribution to the project and for their cheerful tolerance of the demands of the research process.

Abraham Moss High, Lancashire
Bassingbourn Village College, Hertfordshire
Bisham Primary School, Buckinghamshire
Bournville School & Sixth Form College, Birmingham
Broadclyst Community Primary School, Devon
Cherry Orchard Primary School, Birmingham
Chesterton Community College, Cambridge
Cooper Perry Primary School, Staffordshire
Gorsemoor Primary School, Staffordshire
Great Barr School, Birmingham
Hartside Primary School, Crook
Hyde Technology College, Tameside
Inkpen Primary School, Berkshire
King Edward VI Camp Hill School for Boys, Birmingham
Lent Rise Combined School, Slough
Linton Village College, Cambridge
Matthew Moss High School, Rochdale
Newall Green High, Manchester
Newall Green Junior School, Manchester
Ninestiles Community Technology College, Birmingham
Our Lady and St Thomas Primary School, Crook
Phoenix Primary, Liverpool
Radstock Primary School, Reading
Royds Hall High, Huddersfield
Serlby Park, South Yorkshire
SS Mary and John Catholic Primary School, Birmingham
Temple Primary School, Manchester
The Minster School, Nottingham
Tideway School, East Sussex
Tickhill Estfeld Primary School, Doncaster

Appendix B: Response Rates to Research Instruments by School Phase

	Primary	Secondary	All
Maturity Models	**15**	**13**	**28**
ICT Check Lists	**15**	**14**	**29**
Teacher Focus groups (assuming average of 5 per group)	**75**	**75**	**150**
Learner Focus Groups (assuming average of 6 per group)	**180**	**180**	**360**
Learner Technology Walk Throughs (assuming 1 per Key Stage)	**30**	**30**	**60**

Appendix C: Multilevel modelling of the NFER Harnessing Technology Survey data on personalising learning

Harnessing Technology 2008 is a large survey of teachers, ICT co-ordinators and school leaders on the use and impact of ICT in schools. This survey sampled nearly 500 schools (of which roughly 30% were primary, 30% secondary and 40% special schools) and nearly 1700 teachers from those schools. In this analysis we focus on questions relating to the impact of ICT on personalising learning (only one aspect of the much larger survey).

Teacher views of the impact of ICT on personalising learning

Overview:

The *Harnessing Technology 2008* Teacher Questionnaire included several items on the positive impact of ICT on different learners.

- Key stage 1 pupils
- Key stage 2 pupils
- Key stage 3 pupils
- Key stage 4 pupils
- Girls
- Boys
- Able or gifted and talented pupils
- Pupils with Special Educational Needs

Teachers were asked to rate their agreement with a statement that ICT can have a positive impact on these groups in each of the following three ways: ‘Engagement in learning’, ‘Attainment and 'Personalising learning’. The analysis reported here focuses only on the personalising learning questions with particular emphasis on the factors that influence teachers' level of agreement or disagreement with the statement.

A multilevel model of teacher perceptions of the impact of ICT on personalising learning

Each teacher provided agreement or disagreement on a 5 point scale (from 1 ‘strongly agree’ to 5 ‘strongly disagree’) for between one and eight of the eight subgroups described above. Because responses from a given teacher are unlikely to be independent of each other - and because there might also be dependencies between teachers from the same school - a multilevel regression approach was adopted. As responses were ordinal (and because preliminary analysis suggested the responses did not meet the assumptions of Normal response regression models), ordinal logistic regression was used. This models the probability of a response falling into one of the five ordered categories ‘strongly agree’ to ‘strongly disagree’. For the purposes of this model, ‘Do not teach’ responses for a particular subgroup were discarded. It was also necessary to discard a small number of cases (less than 1.5% of teachers and less than 0.25% of total number cases) where teachers provided a

response for only one of the eight subgroups. An initial three level model with subgroup question (level 1), within teacher (level 2), and within school (level 3), suggested negligible variation at the school level and all subsequent modelling adopted a two level structure of subgroup question (level 1) and within teacher (level 2).

Findings of the statistical model

Clear and consistent patterns of responses emerged between the subgroup questions. A number of teacher or school characteristics also predicted teachers' level of agreement that ICT had a positive impact on personalising learning in different learner subgroups. Overall agreement was high with only a small proportion of 'disagree' or 'strongly disagree' responses.

Perhaps the clearest pattern was that agreement with the assertion that ICT facilitates personalisation was higher for older compared to younger pupils with 'Key stage 2' (-.266)[11],'Key stage 3' (-.554) and 'Key stage 4' (-.598) all associated with progressively more agreement relative to 'Key Stage 1'.

For the other groups 'Girls' (-.532), 'Boys' (-.534) and 'Pupils with Special Educational Needs' (-.558) also tended to be associated with higher levels of agreement, with 'Able or gifted and talented pupils' (-.624) mostly likely to elicit agreement.

Taken together these suggest that teachers tend to be positive about use of ICT to provide personalised learning for older pupils (especially key stage 3 and 4) and for particular subgroups within a class.

Among the demographic factors looked at only professional experience stood out as a predictor of agreement with the statement. Professional experience was scored in the *Harnessing Technology* questionnaire from 1, '0-5 years' to 4, '20+ years' and each shift in category from '0-5 years' to '20+ years' was associated with decreasing agreement (+0.137). At the school level two predictors stood out. Teachers in secondary and special schools had similar attitudes, but teachers in primary schools were less likely to agree that ICT had a positive impact on personalising learning (+.415). The Impact 2008 (Underwood *et al.*, 2008) and early Test Bed (Somekh *et al*., 2004) data do show this greater variation across primary schools. However, by the end of the Test Bed (Underwood, Dillon & Twining, 2007) when primary teachers had become immersed in the project and for the Broadband project (Underwood *et al.,* 2005) which selected best practice schools, primary and secondary schools performed at a level. The disparity in these findings is a reflection of the samples. The NFER sample was non-selective but in the Test Bed and Broadband projects data were drawn from best practice schools.

The second predictor was the personalising learning priority factor (identified in the factor analysis of the *Harnessing Technology* school leader questionnaire) ranging from 1, 'low priority' to 3, 'high priority'. Acknowledgement of the benefits of ICT for

[11] These coefficients are log odds (natural logarithms of odds ratios) from the ordered logistic regression. As 1 indicates 'strong agreement' and 5 indicates 'strong disagreement' negative coefficients indicate increased probability of agreement and positive coefficients indicate increased probability of disagreement. As log odds are not straight forward to interpret, the impact of these coefficients on the probability of agreement or disagreement is illustrated below.

the personalisation of learning was higher for teachers in schools where leaders had identified personalising learning as a higher priority (-.196).

Sample teacher scenarios

To illustrate the impact of the model in terms of teacher responses to the different sub questions it is helpful to contrast two different scenarios: one exemplifying the most negative responses and one exemplifying the most positive responses.

Scenario 1

A primary school teacher on sub-question KS1 (i.e., thinking about impact of ICT for KS1 personalisation), who has more than 20 years teaching experience and is in a school where personalisation is consistently low priority has the following probability of a rating:

strongly agree	0.063
agree	0.226
neither agree nor disagree	0.609
disagree	0.086
strongly disagree	0.016

Scenario 2: A secondary or special school teacher thinking about the impact of ICT for personalisation among gifted and talented students, who has only a few years teaching experience and is in a school where personalisation is a high priority has the following probability of a rating:

strongly agree	0.298
agree	0.422
neither agree nor disagree	0.263
disagree	0.015
strongly disagree	0.003

Although attitudes are generally positive there are big differences, ranging from approximately 29% to 72% agreeing or strongly agreeing that ICT has a positive impact on personalising learning.

Appendix D: Stimuli for the Pupil Focus Groups

















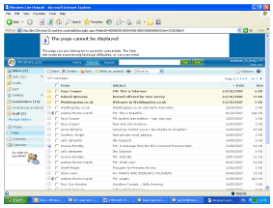


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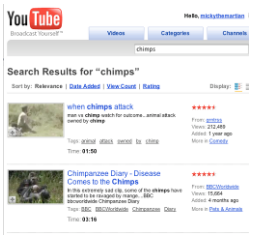
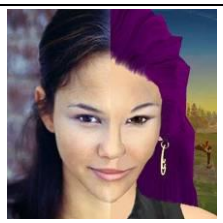
 welcome to the best value in photography	 Google	 YouTube Search Results for "chimps" when chimps attack Chimpanzee Diary - Disease Comes to the Chimps
		
 Sims 2		
	 Matt - Conversation Hi Matt! Wanna grab a bite to eat after the game tonight? Sounds good! What did you have in mind? Well, let's meet in the food court Okay, but I think I'll give the pizza a miss! Send Search	