REVIEW PAPER

REVIEWING THE BARRIERS ASSOCIATED WITH THE TECHNOLOGICAL NEEDS OF TEACHERS IN THE 21ST CENTURY EDUCATION

By

FAEZEH SEYEDARABI

Visiting Lecture, City University, London.

ABSTRACT

This paper reviews barriers associated with the use of ICT tools by teachers in their classroom teaching at 'technical', 'teaching' and 'school' levels. The aim of this review is to highlight the fact that there is currently less research work on the kind of technology teachers need for adopting ICT tools in the 21st century education. There has been much work carried out on easing ICT and internet barriers through resourcing and teacher training. However, there is less work on the sort of technology that teachers would like to use for their teaching, particularly when searching online for teaching resources. Hence, a call for further research in web 'personalisation', an emerging direction that is currently adopted by technologists and the government was made as a proposed new approach or possible solution to the technical barriers of teachers.

Keywords: Classroom Teaching, ICT, Internet, Teachers, Web, Personalisation.

INTRODUCTION

Since the beginning of the 1990s, the UK government has set about incorporating web related technologies and resources into the compulsory and post-compulsory education systems in order to accommodate the educational needs and preferences of students, in the 21st century (Allen 2006; Kitchen, Dixon et al. 2006; DfES 2005; DfES 2003; EDSI 1999; Baker 1997; DfEE 1997). This led to many positive outcomes, for example, in the BESA internet survey of ICT in UK State Schools, it was reported that the confidence and competent level of primary and secondary teachers using ICT in the curriculum was seventy and sixty percent, respectively (BESA 2009, page 5).

However, despite the government's massive investment in ICT-related projects for the teacher training programmes and transformation of schools, inconstant integration of ICT in classroom teaching was reported. For example, in the Becta's 'Leading Next Generation Learning 2009' review, the following was reported:

"There are many examples throughout the education and skills sectors of successful adoption and deployment of technology. However, overall we have not seen technology fully embedded in a way that has transformed our basic processes or the dominant operating and delivery models, and yet other sectors have achieved just that." (Crowne, 2009, page 2)

Furthermore, Ofsted (2008, page 2) reported the following:

"Most schools [primary and secondary] in the sample had a wide range of ICT resources for use in lesson. However, too often the training of teachers and teaching assistants had not kept pace, with the result that these resources were not used to their full potential." (Ofsted, 2008, page 2)

Hence, seeing that in practice teachers are faced with a number of obstacles and challenges when using ICT, researchers have now turned their attention to factors influencing the ICT usage of teachers and schools (Cartwright et al., 2007; Hennessy et al., 2008).

Aims of the Review

The aim of this review is to highlight the fact that there is currently less research work on the kind of technology

teachers need for adopting ICT tools in the 21st century education. The ICT related barriers of teachers need to be addressed through further research on the sort of technology that teachers would like to use in their classroom teaching, particularly when searching online for teaching resources.

Process of the Review

In this review, barriers associated with the use of ICTs in classroom teaching are outlined from the perspective of teachers. Moreover, issues surrounding the internet use vs non-use of teachers in the classroom are reviewed within the wider teaching context. Hence, studies relevant to the ICT barriers of teachers are discussed within the following three interrelated aspects or levels of classroom teaching: (i) technical, (ii) teaching and (iii) school.

Technical–level barriers

A number of technical issues are raised in the literature regarding the non-use of ICT by teachers in the classroom. For instance, in the recent SITES (Second Information Technology in Education Study) investigation of the use of ICT in education school principals, technology coordinators and teachers in mathematics and sciences were surveyed using an online questionnaire. This study involved an approximately four hundred schools and about four teachers per school in each participating education system and was carried out among twenty two countries (Law et al., 2008, page 9). The findings obtained from this study showed that teachers could not achieve all their pedagogical goals in their classroom without the aid of ICT equipment and tools:

"Teachers cannot realize certain pedagogical goals unless information technology equipment and tools are available to them. They need not only sufficient equipment (PCs, printers, internet connections), but also ready access to software tools (for word-processing, communication, information retrieval) and communication facilities (e.g., email addresses for teachers and students)." (Law et al., 2008, page 74)

The SITES study has also identified a number of ICT related obstacles at technical, teaching and or school related levels. For example, (i) Lack of ICT-tools for science laboratory work, (ii) Insufficient ICT-equipment for instruction, (iii) Not enough digital educational resources for instruction and, (iv) Insufficient time for teachers to use ICT were identified as the four main obstacles that were holding schools that is teachers from achieving all their pedagogical goals (Table 1) (Law et al, 2008, Page 96).

Moreover, in a small scale but equally relevant study, Morris (2002) investigated the use of technology in the classroom by studying twenty eight teacher practitioners, within fifty miles of the Pittsburgh State University (USA). In this study, eighteen female and ten male teachers from fourteen primary and secondary schools were surveyed using questionnaire surveys and classroom observations (Morris, 2002, page 4). The results from this study showed that problems associated with 'user-friendliness, availability and 'access' were the main reasons for the lack of teachers ICT integration into their classroom teaching (Morris, 2002).

> "[…] 'easy access' to technology was enjoyed by fewer than a handful of participants. Limited computer lab time [for] students, the absence of technology correlated to objectives and tests for the district [follow-up materials], and the lack of multiple, up-to-date computers in the classroom challenged the majority of the teachers' efforts to integrate technology into the curriculum in a systematic, viable way." (Morris, 2002, pages 14-15)

In this section, past studies related to the ICT obstacles of teachers at technical level were described. Findings from these studies suggested that teachers are unable to fully

Obstacle	%	Obstacle	%
Lack of ICT-tools for science laboratory work	40	Computers are out of date	21
Insufficient ICT-equipment for instruction	31	Insufficient internet bandwidth or speed	21
Not enough digital educational resources for instruction	31	Lack of special ICT-equipment for disabled students	20
Insufficient time for teachers to use ICT	30	Insufficient or inappropriate space to accommodate the school's pedagogical approaches	19
Insufficient qualified technical personnel to support the use of ICT	29	Prescribed curricula are too strict	19
Insufficient number of computers connected to the internet	27	Pressure to score highly on standardized tests	18
Insufficient budget for non-ICT-supplies (e.g., paper, pencils)	25	Using ICT for teaching and/or learning is not a goal of our school	6
Teachers' lack of ICT-skills	23		

Table 1. Average percentages of obstacles selected by schools' principals across 22 education systems. These obstacles hindered the realization of schools' pedagogical goals "a lot" (Law et al., 2008, page 96).

benefit from the available ICT developments in their classroom teaching. In addition, the handful number of studies described in this section highlights the fact that there is currently less research work on this topic, which should be addressed through further research in the kind of technology teachers need for adopting ICT tools in the 21st century teaching. This could include developing tools that can support the internet of teachers and their access to online resources in their day-to-day classroom teaching.

Nevertheless, it is important to recognize that tackling the ICT obstacles of teachers at technical level cannot be determined in isolation, rather it must be understood within the wider teaching context that is the learning needs of students, teachers' individual preferences and the environment or schools in which they work in.

Hence, studies relating to the ICT barriers of teachers at 'teaching–(user) level' and 'school–level' will be briefly outlined in the following sections of this paper, respectively.

Teaching (user)–level barriers

In the face of many recent studies reporting the benefits of teachers using ICT and the internet in classroom teaching like the 'Harnessing Technology in Schools Survey' (Kitchen et al., 2007), Lindsay et al. (2006) and Becta, (2007a), evidence shows that teachers are still faced with a number of teaching-level barriers when incorporating internet into their curriculum. For example, 'insufficient time for teachers to use ICT' and 'teachers' lack of ICT skills' were reported by Law et al. (2008).

Moreover, in a national survey carried out by 'NetDay' in Australia, six hundred public and private school teachers were surveyed with regard to their usage of internet and technology in their classroom teaching. The study reported that despite the enthusiasm and openness of teachers to new technologies and the internet, ICT has not been successfully integrated into the education system in order to benefit the learning outcomes of students. This finding is further highlighted by NetDay, (2001, n.p):

"Teachers are using computers & the Internet primarily as research tools. Teachers value technology and are comfortable with the Internet and technology but are not using it within instruction. The potential of technology and the Internet to revolutionize education has not been effectively leveraged for education results."

Also, the following was reported by Rogers (2003, page 3) on the experience of science teachers using ICT:

> "*I prepared a worksheet in advance which contained step by step instructions on how to access the site. I also gave the pupils specific questions to answer in order to reduce browsing. I also allocated a particular planet to each group (3-4 pupils) to avoid information overload.*"

Additionally, the six main constraints of teachers for their lack of internet use in the classroom teaching were identified as (i) lack of knowledge about good access, (ii) lack of good lessons that use technology, (iii) lack of knowledge about how to use the web effectively, (iv) too much information, (v) inappropriate material on the web and finally (vi) lack of leadership from the principle or administrators (NetDay, 2001, n.p).

Other studies included Guha (2003), who identified the main obstacles for using computers in classroom teaching. In this study, the causes of comfort or discomfort of 149 primary teachers in Western New York were surveyed. This also included interviewing five of the "more comfortable" and five of the "less comfortable" teachers about their use of computers in their classroom teaching (Guha, 2003, page 318). The findings from this study showed that obstacles facing teachers who were less comfortable with using computers in their classroom teaching were 'lack of computers in classrooms' and their 'computer phobia',

> "*Our biggest problem is that a lot of teachers are afraid of computers. Several resources are available. To become more aware of computer' ability, teachers need not be afraid of computers but should learn them. With technology changes it is difficult for teachers and schools to keep up with.*" (Guha, 2003, page 329)

On the other hand, lack of 'time management', 'lack of computers in their classrooms' and 'lack of computer training' were identified as the main barriers for teachers who were more comfortable with using computers in their classroom teaching (Guha, 2003).

The internet use of teachers in their teaching was further investigated in Madden et al. (2005, page 270) survey of

188 heads of departments (aged between 24 to 60 year olds) in secondary schools, in Sheffield. For example, it was reported that,

"[…] fewer than half of the teachers agree with the statement 'I have no problems finding web sites that will be of use in my teaching'."

In this study, Madden et al. (2005, page 269) stated that teachers have concerns about websites' reliability and quality of online resources, as,

"Teachers [were] concerned that 'Web sites too often change or go off-line without notice' […] also tended to feel that 'The content of sites is too unreliable to be of use' […] and that 'The material on the Internet is inappropriate for the National Curriculum'."

Furthermore, Madden et al. (2005, pages 271-272) explained that when using the internet in teaching, teachers were more concerned about their classroom management skills than their ICT skills. Thus, the classroom management skills of teachers were identified as a possible obstacle to using the internet in classroom teaching. Madden et al. (2005) also concluded that head teachers' (respondents) lack of internet experience and confidence in using the internet was due to their age:

"The youngest of today's teachers, therefore, would have had little more contact with ICT at school (except for certain technical applications) than would their older colleagues. They would, however, have had opportunities to explore the potential of the technology at college and university. When they began work, the Internet would have been available for them to incorporate into their teaching. Their older colleagues, by contrast, would have needed to change existing patterns of teaching in order to use it." (Madden et al., 2005, page 273)

Therefore, it was predicted that the internet use of teachers in their teaching will rise rapidly through sharing and or exchanging knowledge online (Madden et al., 2005). This finding is also in line with the BESA (2007) survey of ICT use in UK schools, as lack of time and classroom management was only identified by a relatively small group of teachers:

"16% of primary and a fifth of secondary schools

identify class control issues as one of the pitfalls of using ICT in the classroom. A similar number have concerns about the effect of ICT on the reduction of available teaching time." (BESA, 2007, page 10)

Despite the fact that findings from studies like the Larner & Timberlake (1995) go back to more than ten years ago, NetDay (2001) findings to eleven years ago and Guha (2003) findings to nine years ago, problems associated with teachers' lack of ICT and internet usages still remains to be fully determined. For example, Sorensen et al. (2007) conducted a longitudinal study of the beliefs and attitudes of teacher trainees and their use of the internet in classroom teaching, in England. In this study, problems associated with limited pedagogical guidance and the availability of good role models were said to be unresolved since the internet:

"[…] use remains fairly limited and there is not clear understanding of what constitutes good use of the Internet." (Sorensen et al., 2007, page 1620)

Furthermore, it was reported that problems associated with the execution of lesson plans have also resulted in the lack of internet use by teachers in their classroom teaching. For example, the time taken to identify good websites at the right educational level was identified as one of the causes for teachers lack of internet use (Twidle et al., 2006, page 218). The need for more teacher support is highlighted in the following statement:

"overall I think the Internet is a brilliant resource but [teachers] need more support." said one teacher, cited in (Twidle et al., 2006, page 219).

This finding is also in support of Law et al. (2008) findings, as in their study 'Insufficient time for teachers to use ICT' was highlighted to be the third most selected obstacle that contributed to holding back schools (school teachers) from achieving all their pedagogical goals. Moreover, in the 'Harnessing Technology, Preliminary Review 2008', the following was reported:

"A lack of time, willingness or the resources to develop new pedagogical approaches is a major barrier to fully exploiting the educational potential of digital technology." (Chowcat et al., 2008, page 20)

Similarly, Hennessy, Ruthven and Brindley (2008) investigated the ways in which internet is integrated into teachers' daily lesson plans by carrying out 18 group interviews among secondary teachers of the core subjects English, Mathematics and Science, in England. The selected teachers were from six state secondary schools, all located within fifty miles from Cambridge (Hennessy et al., 2008, page 11).

In this study, it was concluded that the lack of ICT integration of teachers into classroom teaching (into their particular subject area) was due to factors affecting their individual commitment and indeed educational reflective and critical outlook. For example, teachers expressed their concerns about the educational value of incorporating ICT related activities or a particular technology into their classroom teaching. Teachers also had concerns about the way a technology can be integrated into their schemes of work and consistency in types of use between departmental colleagues (Hennessy et al., 2008, page 32).

Additionally, the ICT use of teachers into classroom teaching and indeed their school practice can also be influenced by their taught 'subject', 'departmental cultures' and individual teaching preferences, which can ultimately affect the teaching style and assessment criteria of individual teachers as well as resources they select for their classroom teaching. The importance of subject subculture on schools and on the practice of teachers is highlighted in the followings:

> *"Research that has been carried out in this area indicates that subject subculture has a very strong influence on school organization and practice."* *(Selwyn, 1999, page 30)*

Accordingly, studies (Moss, 1992; Pelgrum and Plomp, 2001; Watson, 1993) have reported that the level of computer use (IT) by teachers in their classroom are different from one subject to another. Nevertheless, in the Selwyn (1999) study of subject cultures on different educational contexts it was concluded that achieving a balanced distribution of IT or computer usage among different subject teachers will not be feasible but instead findings from studies in subject cultures can be used to assist relevant parties i.e. governmental bodies to make better informed educational decisions and or planning across different subject areas.

> *"[…] it is unlikely that IT will ever be totally integrated into every subject area. Nevertheless, awareness of the reasons underlying these different reactions to IT will help to reduce the 'clash' between individual subject cultures and the culture of educational computing."* *(Selwyn, 1999, page 46)*

Further to the above discussion on the ICT barriers of teachers at teaching level, the following section of this review will outline the ICT related barriers of teachers at school level.

School–level barriers

In BESA (2009) report, it was stated that,

> *"English primary schools are expected to budget £39 million on curriculum software and digital content in 2009-10 […] English secondary schools are expected to budget £45 million on all curriculum software and content in 2009-10."* *(BESA, 2009, page 5)*

However, despite the government's continued investments in schools ICT equipments and teaching resources, teachers are still faced with a number of school-level barriers when incorporating internet into their teaching. For example, schools lack of teacher support and internet access was reported in the 'Harnessing Technology Review 2007' (Becta, 2007a).

The lack of end user support was further reported by Becta (2007b, page 14), as only twenty seven percent of the primary teachers were reported to have received technical support when using the internet in addition to thirty three percent of the primary schools having problems with their internet (broadband) connections. (Becta, 2007b, page 14)

Other problems include establishing links between different learning platforms and the Management Information Systems (MIS). The schools use of learning platforms and MIS was outlined in the following:

> *"Very few schools with learning platforms have a link to the school MIS, and numbers are low (33 per cent) for FE colleges."* *(Becta, 2007a, page 68)*

Lack of ICT computer access was highlighted by BESA (2009) and Ofsted (2008) survey. For example, "80% of primary and 90% of secondary school teachers suggest that limited access to ICT is affecting their use of ICT in the classroom. 39% of primary and 41% of secondary schools indicate limited access to computers in the classroom." (BESA, 2009, page 5)

Also decline in the confidence of teachers was highlighted by Madden et al. (2005) and Ofsted (2008) survey. For example, Madden et al. (2005, page 272) explained that in his study:

"The proportion of teachers confident in their ability to use the Internet (72%) was notably less than the national average in 2002. According to DfES statistics (2003), 81% of teachers in 2002 felt 'confident to use ICT in their subject teaching'."

However, the ICT training of teachers was to some extent improved, as in BESA (2009, page 5) it was observed that:

"59% of primary teachers will receive ICT training in 2009, compared to 67% who expected training in 2008. 55% of secondary teachers will receive training in 2009, compared to 72% in 2007. For those teachers receiving ICT training, around 71% of primary and 63% secondary school teachers found it very useful, with all but 7% of primary and 9% of secondary school teachers finding it of some use."

Furthermore, in a smaller scale but equally relevant study, Twidle et al. (2006) investigated the use of the internet by trainee teachers involving 128 student science teachers studying for their Post Graduate Certificate of Education (PGCE) at five English higher education institutions. In this study, the attitudes towards and experiences, competence and confidence of trainee teachers were studied using a questionnaire survey and a selection of structured interviews and observations. Based on this investigation, lack of 'technical support' and 'access' to the internet were identified as the two main problems linked to teacher trainees' lack of internet use in their classroom. For example, the authors explained that:

"[…] the key is to find the right sites at the right level. Even then there can be problems with the school blocking particular sites." said one teacher, cited in

(Twidle et al., 2006, page 218)

Hence, to support teachers with the use of online resources in their classroom teaching, a call for further research was made on ways of using the internet. In relation to the requirements of pedagogical factors for executing a successful lesson i.e. finding online resources that are related to the teaching topic and curriculum teachers as well as their students' educational level or learning needs (Twidle et al., 2006).

Additionally, Twidle et al., (2006) findings were used to pursue a longitudinal study of the beliefs, attitudes and internet usage of teacher trainees, in England (Sorensen et al., 2007, page 1620). Findings from Sorensen et al., (2007) were discussed in the 'Teaching–level barriers'.

Moreover, according to Cuban (2001), the computer usage of teachers in their classroom teaching was mainly to complement their existing teaching materials or practices rather than to create new innovative ways of practicing their teaching. Cuban included that the concept of computers as a new piece of technology for improving classroom teaching has been heavily advertised by the government and indeed the technology developers without actually thoroughly planning its integration into the daily teaching practices of teachers (Cuban, 2001).

"[…] I have concluded that computers in classroom have been oversold by promoters and policymakers and underused by teachers and students." (Cuban, 2001, page 195)

Similarly, according to the Ofsted (2002) report, the internet and online teaching resources were found to be used by teachers to enhance their classroom teaching and not as a replacement. Teachers asked their students to search online for relevant materials like text, pictures and sounds in order to design word documents or to prepare for class presentations. The internet use of teachers was further described by Ofsted (2002, pages 4-5):

"It is becoming increasingly common for Key Stage 2 pupils to use ICT for displays and presentations. For example, in one primary school, Year 6 pupils gave an effective presentation of a story to Year 1 pupils using text, sounds and pictures."

Other examples included that of VanFossen (1999), who investigated the internet use of secondary and post-compulsory teachers in Indiana. In this study, a questionnaire survey was mailed to 350 randomly selected teachers that was drawn from a list of 4,103 high school and middle school teachers in the public and private schools, from which a total of one hundred and ninety one responses were received (Vanfossen, 1999, page 1).

Hence, Vanfossen (1999) reported that the lack of teachers training in their subject areas concerning their curriculum and pedagogy as well as the lack of schools ICT equipment, internet access rights of students and schools access to the internet are the most common factors restricting teachers from further use of the internet in their classroom teaching (Vanfossen, 1999). The internet use of the teachers are further outlined by Vanfossen (1999, page 14), which is also in line with Law et al., (2008) review of teachers' top major ICT obstacles:

"The most common factors cited included: lack of training in how to apply the Internet to the classroom (59.5%), problems with Internet access in classrooms (47.7%), lack of general computer training (32.7%), concern over students accessing inappropriate materials via the Internet/WWW (30.1%) and lack of Internet/WWW access in the school building (22.2%)."

Accordingly, to increase the ICT usage of teachers, Leach and Moon (2000, page 385), suggested that the government's ICT policies for school improvement could be better implemented within the UK education system, if a stronger conceptualization of teachers' professional knowledge was constructed. Thus, in this model, the individual teachers' 'personal construct' was depicted in the centre of the process and the 'subject knowledge', 'school knowledge' and 'pedagogic knowledge' of teachers were depicted as being the three inter-related factors influencing the professional knowledge or decision of teachers for their use vs non-use of ICT related activities (technologies), when preparing lesson plans (Leach and Moon, 2000). The model was further outlined by Leach and Moon (2000, page 396):

"Given a concern to encourage the process of teacher development, as well as to change classroom practice and improve the quality of teaching and learning, we believe it is necessary to consider the interaction of the concepts of arenas and settings with what is now understood about teacher knowledge. This includes subject and pedagogic knowledge."

In this model, factors influencing teachers' subject knowledge were listed as the essential questions of the subject, networks of concepts, theoretical frameworks, methods of enquiry and symbolic systems, vocabularies and models. Factors influencing school knowledge included the process of transformation from subject knowledge, historical, ideological, educational origins and discourse, vocabularies and models. Factors influencing pedagogic knowledge involved teachers' goals of learning, knowledge of learners in the setting, selection of knowledge that is the subject of the learning, selection of learning and assessment activities, resources – human, material, technological, discourse and the teachers' roles and relationships in the classroom teaching. Finally, personal construct was outlined as individual teachers' personal view of what constitutes good teaching (educational goals), view of mind and learning and prior individual experience including culture, gender and ethnicity (Leach and Moon, 2000, pages 396-397).

Interestingly, in the Ofsted latest report, schools ICT policies were also highlighted as an influential factor for the lack of teachers ICT usage in their classroom teaching:

"More commonly, there were shortcomings in the strategic leadership of ICT. This had a negative impact on all aspects of provision, including infrastructure, curriculum and, most importantly, achievement and standards." (Ofsted, 2008, page 1)

In this report, schools were using ICT for their management of daily activities and the actual integration within the individual schools is not properly planned or included at the infrastructure level (Ofsted, 2008).

Subsequently, the ICT technical related obstacles discussed earlier in this paper together with teaching, and school level barriers are evidence that in reality, teachers are not making the best use of the internet in their classroom teaching. Thus, a proposed new approach or

solution to the internet and online resources use of teachers is needed.

Discussion

In this paper, the teachers barriers associated with the integration of ICT tools in classroom teaching at 'technical', 'teaching' and 'school' levels were reviewed. This review highlighted the fact that there has been much work carried out on easing ICT barriers through resourcing and teacher training (Davis 2009; Kitchen, Dixon et al. 2006; DfEE 1997; DfES 2003). However, there is less work on the sort of technology that teachers would like to use for their teaching, particularly in the 21st century education, which undoubtedly would involve accessing educational resources on the internet and searching online for teaching resources.

Implications of the Study

In theory, teachers should be using the internet in their teaching, especially for information searching and retrieval, but in practice they choose not to use ICTs such as the internet in the way it was originally prescribed by the government's educational policies through their initiations and funding. The inconsistent use of ICT in schools was further described in the Ofsted (2009), press release:

> "Government investment and better planning in schools have contributed to improvement in the quality of school information and communication technology (ICT) lessons, yet not all pupils are benefiting, according to a report published today by Ofsted, the Office for Standards in Education, Children's Services and Skills."

Therefore, to further support the web searching and information retrieval needs of teachers, the following recommendation is provided.

Recommendation

The author's recommendation based on this review is that further research is required in the field of web 'personalisation' for teachers; an emerging direction that is currently adopted by technologists and the UK government (Heppell, 2008; Sunikka and Bragge, 2008; DfES, 2006; Wirken, 2006), particularly when searching online for teaching resources. Hence, web personalisation can be

adopted as a proposed new approach or possible solution to the technical barriers of teachers. For example, this could include researchers working on design and developing personalised search tools for individual teachers to locate, store, share, create and or re-use online resources in their classroom teaching. The need for developing a personalised search tool for teachers is further discussed by Seyedarabi (2011):

> "[…] studying the web search practices by teachers would also aid researchers to design and develop a model of teachers' web information needs and search behavior relevant to educational software design. This can ultimately be used by search engine designers and or developers to better understand the web searching needs and preferences of teachers, when designing their search tools."

Acknowledgement

References

[1]. Allen, F. (2006). *Has Knowledge changed forevere? Conneted: Learning and Teaching Scotland*. Glasgow.

[2]. Baker, M. (1997). *The National Grid for Learning Consultation Paper: A Personal Response.* Retrieved from http://atschool.eduweb.co.uk/mbaker/material/natgrid.html

[3]. Becta. (2007a). *Harnessing Technology Review 2007: Progress and impact of technology in education*. Retrieved from http://publications.becta.org.uk/display.cfm? resId=33979

[4]. Becta. (2007b). *Harnessing Technology Review 2007: Progress and impact of technology in education: summary report.* Retrieved from http://partners.becta.org.uk/index.php?section=rh&catcode=_re_rp_02&rid=14409

[5]. BESA. (2007). *Information and Communication Technology in UK State Schools:* Summary Report. *Volume 1 & 2.*

[6]. BESA. (2009). BESA ICT in UK State Schools 2009 summary report ICT Provision & Use in 2009/10. *A summary document containing highlighted trend, and headline statistics from BESA's ICT in UK State Schools 2009 summary report.* BESA. Retrieved from http://www.besa.org.uk/besa/documents/view.jsp?item=1326

[7]. Cartwright, V., & Hammond, M. (2007). "Fitting it in": A study exploring ICT use in a UK primary school. *Australian Journal of Educational Technology,* 23(3), 390-407.

[8]. Chowcat, I., Phillips, B., & Popham, J. (2008). *Harnessing Technology: Preliminary identification of trends affecting the use of technology for learning*. Nottingham: Learning Sciences Research Institute, University of Nottingham.

[9]. Crowne, S. (2009). *Next Generation Learning: Leading a Strategy for Success.* (Becta, Ed.). London: Becta.

[10]. Cuban, L. (2001). *Oversold And Underused: Computers In The Classroom.* Cambridge, Massachusetts: Harvard University Press.

[11]. Davis, R. (2009). *A gigantic online swapshop.* The Guardian. Retrieved from http://www.guardian.co.uk/education/2009/apr/14/national-digital-resource-bank-teaching?INTCMP=SRCH

[12]. DfEE. (1997). *Connecting the Learning Society, National Grid for Learning, The Government's Consulation Paper.* Department for Education and Employment (DfEE). Retrieved from http://www.dcsf.gov.uk/ consultations/downloadableDocs/42_1.pdf

[13]. DfES. (2003). *Fulfilling the Potential: Transforming teaching and learning through ICT in schools.* DfES. Retrieved from http://www.dfes.gov.uk/ictinschools

[14]. DfES. (2005). The e-Strategy "Harnessing Technology: Transforming learning and children's services' [UK].

[15]. DfES. (2006). 2020 Vision; *Report of the Teaching and Learning in 2020 Review Group.* Retrieved from http://publications.education.gov.uk/eOrderingDownload/6856-DfES-Teaching and Learning.pdf

[16]. EDSI. (1999). *Educational Departments' Superhighways Initiative.* Becta Government & partners. Retrieved from http://partners.becta.org.uk/index.php?section=rh&catcode=&rid=13686

[17]. Guha, S. (2003). Are We All Technically Prepared? - Teachers' Perspective on the Causes of Comfort or Discomfort in Using Computers at Elementary Grade Teaching. *Information Technology in Childhood Education Annual,* 317-349.

[18]. Hennessy, S., Ruthven, K., & Brindley, S. (2008). Teacher perspectives on integrating ICT into subject teaching: Commitment, constraints, caution and change.

[19]. Heppell, S. (2008). Education 2020. *ESCalate Newsletter.* Retrieved from http://escalate.ac.uk/4454

[20]. Kitchen, S., Dixon, J., McFarlane, A., Roche, N., & Finch, S. (2006). *Curriculum Online,* Final Report. Becta. Retrieved from http://www.becta.org.uk

[21]. Kitchen, S., Finch, S., & Sinclair, R. (2007). *Harnessing Technology Schools Survey* 2007. Conventry:Becta. Retrieved from http://partners.becta.org.uk/index.php?section=rh&catcode=_re_rp_02&rid=14110

[22]. Larner, David K.; Timberlake, L. M. (1995). *Teachers with Limited Computer Knowledge: Variables Affecting Use and Hints To Increase Use.* Retrieved from http://www.eric.ed.gov/PDFS/ED384595.pdf

[23]. Law, N., Pelgrum, W.J., and Plomp, T., eds. (2008). Pedagogy and ICT Use In Schools Around The World: Findings from the IEA SITES 2006 study (Hong Knog, CERC-Springer).

[24]. Leach, J., & Moon, B. (2000). Pedagogy, information and communications technology and teachers' professional knowledge. *The Curriculum Journal* , 11(3), 385-404.

[25]. Lindsay, G., Muijs, D., Hartas, D., & Band, S. (2006). Evaluation of Capital Moderation Funding For Electronic Registration in Selected Secondary Schools. *DfES*. Retrieved from www.dfes.gov.uk/research/programmeofresearch/projectinformation.cfm?projectid=13713&resultpage=1

[26]. Madden, A., Ford, N., Miller, D., & Levy, P. (2005). Using the Internet in teaching: the views of practitioners (A survey of the views of secondary school teachers in Sheffield, UK). *British Journal of Educational Technology,* 36(2).

[27]. Morris, M. (2002). *How New Teachers Use Technology in the Classroom.* Paper presented at: Association of

Teacher Educators. Williamsburg, VA: EDRS.

[28]. Moss, G. D. (1992). Computing awareness and use of content-free software in comprehensive schools. *Computers and Education*, 18(4).

[29]. NetDay. (2001). *The Internet, Technology and Teachers.* Retrieved from www.netday.org/downloads/Web_survey_briefing.pdf

[30]. Ofsted. (2002). *ICT in Schools: Effect of government initiatives, Implementation in Primary Schools and Effect on Literacy.* Crown. Retrieved from www.ofsted.gov.uk

[31]. Ofsted. (2008). *ICT in primary and secondary schools: Ofsted's findings 2005/2007.* Crown. Retrieved from www.ofsted.gov.uk

[32]. Ofsted. (2009). Press release: Information and communication technology in schools improving but inconsistent; some secondary schools lag behind. *Ofsted.* Retrieved from http://www.ofsted.gov.uk/news/information-and-communication-technology-schools-improving-inconsistent-some-secondary-schools-lag-b

[33]. Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers and Education,* 37, 163-178.

[34]. Rogers, L. (2003). Does ICT In Science Really Work In The Classroom? *GIREP Seminar.* University of Leicester, England: Udine.

[35]. Selwyn, N. (1999). Differences in educational computer use: the influence of subject cultures. *Curriculum Journal,* 10(1). doi:10.1080/0958517990100104

[36]. Seyedarabi, F. (2011). Personalization: An emerging direction for tackling the web searching barriers faced by teachers when searching for educational resources. *Webology,* 8(2).

[37]. Sorensen, P., Twidle, J., Childs, A., & Godwin, J. (2007). The Use of the Internet in Science Teaching: A longitudinal study of developments in use by student teachers in England. *International Journal of Science Education*, 29(13), 1605-1627.

[38]. Sunikka, A., & Bragge, J. (2008). What, Who and Where: Insights into Personalization. *Proceedings of the 41st Hawaii International Conference on System Sciences.* Waikoloa, HI.

[39]. Twidle, J., Sorensen, P., Childs, A., Godwin, J., & Dussart, M. (2006). Issues, challenges and needs of student science teachers in using the Internet as a tool for teaching. *Technology, Pedagogy and Education*, 15(2), 207-221.

[40]. Vanfossen, P. J. (1999). "Teachers would have to be crazy not to use the Internet": A preliminary Analysis of the Use of the Internet/WWW by Secondary Social Studies Teachers in Indiana. *Information Technology for Teacher Education,* 2(2), 139-153.

[41]. Watson, D. (1993). The ImpacT Report: An Evaluation of the Impact of IT on Children's Achievements in Primary and Secondary Schools (London, Centre for Educational Studies).

[42]. Wirken, D. (2006). *The Issue Of Trust With Search Engines And The World Wide Web.* Article Karma.com, 2006(12 October), 1-2. Article Dashboard. Retrieved from http://www.articlekarma.com/Article/The-Issue-Of-Trust-With-Search-Engines-And-The-World-Wide-Web/21773

ABOUT THE AUTHOR

Faezeh Seyedarabi is a Visiting Lecture at City University London and also Fellow of the Higher Education Academy (FHEA), with ten years of teaching experience. For more information please visit www.faezeh.co.uk and she can be contacted via email faezeh.seyedarabi.1@city.ac.uk