

REPORT 15:

# E-inclusion: Learning Difficulties and Digital Technologies

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Chris Abbott, Kings College, London



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## FOREWORD

Too often, discussions of the role of digital technologies for learning skate over the wide variety of differences which exist between different groups of learners. Often, 'the learner' is presented as a single, unitary figure defined solely by age; as 'children', 'teenagers', 'adults' etc. And yet, there are clearly wide differences in the ways in which different groups of children respond to, benefit from, or are excluded by specific uses of digital technologies.

This review focuses specifically on the use of digital technologies to enable children with learning difficulties to learn effectively. Its goal is to move beyond some of the hype and marketing rhetoric that sometimes characterises this field and to ask nuanced questions about the evidence that exists of the role of digital technologies in this area.

The review moves away from a dominant medical model of learning difficulties and, instead, asks us to pay detailed attention to learning contexts. As such, it foregrounds the learning practices and communities that might be enabled with digital technologies to create rich and empowering learning environments for children with learning difficulties. It offers a new taxonomy of the use of digital technologies in this field, providing a historical and

philosophical overview of three key approaches to using technology either 1) to train or rehearse; 2) to assist learning; or 3) to enable learning. It concludes by offering a set of challenges to industry and educators to create more collaborative, holistic and inclusive learning communities through digital technologies.

We look forward to hearing your views on this review and to receiving your comments via email ([research@futurelab.org.uk](mailto:research@futurelab.org.uk)) or our website.

Keri Facer  
Research Director  
Futurelab

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# EXECUTIVE SUMMARY



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## EXECUTIVE SUMMARY

Any examination of the education of all young people, including those who struggle to learn, must first consider the words to be used. The adoption of terms such as learning difficulties within education is not merely an example of changing fashions of terminology; it is an indication of a developing understanding of the extent to which these difficulties are produced by the context in which learners are placed. Learning difficulties has the added advantage of being a term seen as acceptable by many of those to which it has been applied. E-inclusion is the term used here to describe the use of digital technologies to minimise or even remove those learning difficulties.

One major driver of the change of understanding in this area has been the widespread adoption of the social model of inclusion, rather than using the medical model which sees learning difficulties as biologically determined. Within the social model, learning difficulties are seen to be created by the context in which learning takes place.

Writing about e-inclusion will always carry the risk of a slide into technological determinism. The aim throughout this report has been to recognise that the focus should be not just on the pedagogical approach but also the context and conditions in which learning takes place. Most importantly, that focus will not be on the technologies themselves, innovative though they may be.

There is little longitudinal, large-scale research into e-inclusion, such as the five-year study in the USA which showed changing patterns of technology use by

students with autism (Mirenda, Wilk and Carson 2000). The vast majority of the research that does exist is small-scale and related to particular products. Only the most expensive and potentially profitable aspects of digital technology for learning difficulties, such as Integrated Learning Systems, have been the focus of major research. Too often, such research has been damaged by the extent of the involvement of resource providers with pecuniary interest.

Our developing understanding of the negative effects of labelling, and of the effects of pathologising learners, has led to new challenges for producers of digital technologies aimed at assisting with e-inclusion. The mutually beneficial relationship between producers and special schools of the past has been replaced by the need for much greater awareness of e-inclusion among schools in general and across a wide range of resource providers.

Approaches to using digital technologies for e-inclusion are presented in this report under three categories:

- using technology to train or rehearse
- using technology to assist learning
- using technology to enable learning.

By considering these categories, it is possible to recognise the limitations of drill and practice software and the potential of socially collaborative use of digital technologies. Although computers have been used to some effect to assist learners to practise skills, it is only when they have been employed to enable learning that the full potential of e-inclusion has begun to be revealed.

Developments in the 1980s that attempted to make use of socially constructed learning around computers were often misunderstood or misrepresented. Expensive and profitable developments such as Integrated Learning Systems or electronic whiteboards have been presented as harbingers of change, in an unholy alliance between technological determinism and politically dogmatic interference.

More recently, truly collaborative uses of digital technologies have often been linked to access, through the internet, to other groups of learners. This development, together with innovative technological advances, is leading to a second wave of e-inclusion which is collaborative rather than individually supportive, holistic rather than skills-based and inclusive rather than separatist. E-inclusion has come of age.



# INTRODUCTION



## 1 INTRODUCTION

### 1.1 OVERVIEW OF THE REVIEW

This paper is concerned with reviewing research into the use of digital technologies by people with learning difficulties in educational settings. It deals specifically with that group of people who have been identified as having learning difficulties or cognitive impairment. It does not deal with the needs of those who may have sensory impairment, related to sight or hearing, and neither does it attempt to cover specific areas such as language impairment. It is learning difficulties, however, which is the most commonly encountered need in the average classroom.

The aim of this paper is to provide a review of the research literature (where it exists) and to map out fruitful and productive ways forward for those concerned with the policy, practice and design of digital technologies for use by teachers, parents and learners with learning difficulties in education. The paper is intended for a wide audience of readers, from specialists in the areas of learning difficulties or digital technologies to those only just entering the field. As such, concepts and terms, which may be taken for granted by some, are explained in order to ensure that all readers are able to explore the arguments.

This introduction begins with a definition of the key terms to be used in the review, and a discussion of the limitations and strengths of the research in this field. Section 2 maps the wider context of current and historical understandings of learning difficulties, and explains why the social model of learning difficulties is used as a framework for this review. Section 3 provides an account of the different

paradigms of technology use in this field, identifying three key types of use: the use of technologies to train or rehearse; the use of technologies to assist learning; and the use of technologies to enable learning. Section 4 takes an overview of the research and identifies potential routes forward for developers, policy makers, researchers and practitioners.

### 1.2 DEFINITION OF KEY TERMS

This literature review deals with the intersection between three complex concepts: **e-inclusion**, **learning difficulties** and **digital technologies**.

A focus on **digital technologies** better summarises the range of tools now in use by young people than would the use of a term such as ICT. Digital technologies may be hardware-based (such as computers, mobile phones, players of downloadable audio or games consoles); or they may be software-based (as is the case with web applications, social networking spaces, computer games or chat sites). In the case of this review the term also encompasses technologies such as virtual reality, Integrated Learning Systems and multimedia. The term digital technologies is used to emphasise the wide range of tools and resources that young people might access both inside and outside the school.

It is relatively straightforward to define digital technologies then; but a term such as **learning difficulties** raises much more complex issues. Many semantic strategies have been adopted to describe those people who do not seem to learn as quickly or as easily as many of their peers, but the terms in use have often come to be

seen as indicative of a phase of understanding. As our awareness of the complexity of this issue develops, so does our reluctance to accept previous terminology. Descriptive terms such as handicapped or educationally subnormal, not seen as in any way judgemental or inappropriate in the 1970s, have now become totally unacceptable. This review is also written at a time of major shift in the way in which differences in learning are understood, with a term such as Special Educational Needs (SEN), once universally accepted, now seen by some as a product of an outdated medical model, of which more below. As an example of this trend, the term SEN has been superseded in Scotland since 2004 by the use of ASN – Alternative Support Needs – a wider term which also covers areas such as language support. This move has met some criticism within Scotland by those who see such changes as part of a trend by which disability seems to progressively disappear (MacKay 2002), and in such a way that the needs of those described as disabled are no longer fully met.

Learning difficulties and learning disabilities, however, are terms widely used at present within adult as well as young learner circles. The terms are sometimes, but not always, used interchangeably. Ofsted, for example, now uses the term Learning Difficulties and Disabilities (LDD). However, many adults who have been described in this way have asked that the term learning difficulties be used in preference to learning disabilities, and for this reason it has been adopted in this publication. It is not clear why this preference has developed, but it seems appropriate to follow the wishes of the people who will be labelled in this way, even if the reasons for their choice of

descriptor are not clear. The term learning difficulties also acknowledges that such difficulties may be temporary or transitory; a person may have learning difficulties in one context but not in another, or at one stage of their life but not at a later one.

**E-inclusion** can be understood within the context of a wider set of debates around **social inclusion** and **social justice**.

Social inclusion is a basic principle of human rights and is closely linked to concepts of social justice. When inclusion was first discussed within educational settings, it was largely as a result of the efforts of the disability rights movement, with an initial link in particular to the needs of those with physical disabilities. It is for this reason that inclusion often came to be seen as being linked to putting ramps at building entrances and installing lifts, so that wheelchair users could access upper floors. More recently, many commentators have begun to talk of inclusion in a much wider sense to cover what is sometimes described as social inclusion: inclusion regardless of gender, race, age, sexuality, disability or class.

Social justice in education is a contested and complex area (Barry 2005), but two attempts to summarise the area, published by the same author but eight years apart, give an overview of the developing concepts (Gewirtz 1998, 2006). In her recent paper, Gewirtz argues that social justice cannot be reduced to a single account or set of measures, but is intimately tied up with practice:

"...judgement about what counts as justice in education cannot be divorced from judgements about what is possible. Because in the real world principles do not



e-inclusion can be understood within the context of debates around social inclusion and social justice

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translate precisely into practice, just as practices only ever meet with partial degrees of success... any model of justice must face the challenge of reducing the inequities of distribution, recognition and association which oppress and marginalize groups represented by people such as Martin." (Gewirtz 2006, p79-80)

Throughout the 1980s, a major movement towards integration in education developed. This was aimed at the integration of young people then identified as having special educational needs and was later overtaken by the social model of inclusion. Integration and inclusion are sometimes seen as two words for the same concept but they are actually quite distinctive. **Integration** was the process by which schools and other institutions made small changes in order to enable particular learners to share a lesson or a subject, or get access to a building. **Inclusion** is a much more fundamental concept by which the needs of potential users with learning difficulties are considered at an earlier stage and learning environments are set up to be inclusive, whether or not the need for such changes appears to be present.

**E-inclusion** is a much more recent term which is often used to refer to the use of digital technologies to break down barriers of gender, race, age, sexuality or class. Within research circles, e-inclusion has links with developments in the disability studies movement, and the emphasis to be found there on issues such as culture, agency and identity (Riddell and Watson 2003; Shakespeare 1994). At the same time, e-inclusion is also used to refer to debates surrounding the emergence of digital divides (see Selwyn and Facer 2007) through inequalities in access to and use

of digital technologies for social, leisure and citizenship purposes. The digital divide is an issue for many countries, with China, soon to become the home for the most numerous national group of internet users, among those countries now recognising these concerns (Guo, Bricout and Huang 2004). In almost every case, people with learning difficulties are the wrong side of that divide.

The term e-inclusion in this review relates to the use of digital technologies to enable inclusive learning practices for people with learning difficulties. Although some advertisers may refer to 'e-inclusion equipment' or 'e-inclusion software', it is much more appropriate to talk about **e-inclusion practices**, a term which emphasises the interaction between digital tools, contexts and people, and focuses attention on the activity of the use of digital technologies by or with people with learning difficulties. It is this wider understanding of the interaction between digital technologies, contexts and people which is now often, and more accurately, described as e-inclusion.

## 1.3 COMMENTS ON THE RESEARCH FIELD

There is little longitudinal, large-scale research into e-inclusion, such as the five-year study in the USA which showed changing patterns of technology use by students with autism (Mirenda et al 2000). The vast majority of the research that does exist is small-scale and related to particular products. Only the most expensive and potentially profitable aspects of digital technology for learning difficulties, such as Integrated Learning Systems, have been the focus of major

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research. Too often, such research has been damaged by the extent of the involvement of resource providers with pecuniary interest.

Research into the education of children with learning difficulties tends to be concentrated around particular topics such as dyslexia (Payne and Turner 1999; Singleton 1994), perhaps because these are the areas for which research funding can most easily be obtained. There is a strong emphasis in much of the literature on teachers as researchers (Rose and Grosvenor 2001), and whilst this is to be welcomed, it is also relatively inexpensive to fund compared to large-scale fully-funded research by experienced practitioners whose results will be acceptable to peer-reviewed academic journals.

There is little published, peer-reviewed research related to the use of digital technologies to assist those with learning difficulties to learn more effectively and efficiently, although the use of information technology to manage information about such learners has featured (Carr, McGuinness, Oatey and Holder 1992). There is a growing body of anecdotal evidence, much of it lively, well-written and worthy of study, but the amount of substantial or longitudinal research remains disappointing. Even research with titles suggesting a wide-ranging discussion of a topic can once again be seen to be evaluation in a different guise. A recent paper in a key European journal for example (Fasting and Lyster 2005) had the title 'The effects of computer technology in assisting the development of literacy in young struggling readers and spellers' and yet even the briefest of readings of the paper shows it to be an evaluation of the

use of a particular software product. In a similar vein, US-based research into computer-based texts (Twyman and Tindal 2006) is often marked by cultural norms to the extent that, in this example, the value of the textbook is a given and the discussion in the paper relates to the extent to which the computer-based text can play a textbook-like role.

Too often, the research can be accused of a technologically determinist perspective which takes insufficient account of the social and cultural contexts which support the technology use. As such, much of the research into aspects of disability and technology has been related to the evaluation of particular hardware or software, rather than looking at the pedagogical context in which technology is used. Examples of this include an examination of the benefits of a particular proprietary switch (Cole and Swinth 2004) or research into the benefits of one brand of reading pen rather than this technology in general (Higgins and Raskind 2005). Even when the focus appears to be communities of practice, the research may be into one particular model of collaborative learning (Zorfass and Rivero 2005). One of the risks inherent in this approach is that there may be other factors at play – including changing teacher roles – and any perceived improvement could be as a result of other causal agents rather than the technology under consideration.

A fairly recent Becta leaflet (Becta 2003) summarised research into what it described then as ICT supporting SEN and inclusion; this document contains 16 citations, and only six of these are from peer-reviewed academic journals. One of the key findings from research, according

too often, the research can be accused of a technologically determinist perspective

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to this publication, is that ICT can enable greater autonomy for learners; and there is also emphasis on unlocking hidden potential, a trope to be met in other emancipatory or revelatory writings on ICT. An unpublished research report for Becta produced more recently (Hick et al 2005) dealt with the topic in more detail but also covered the inclusion of older people, and dealt with other difficulties as well as those related to learning. This wide-ranging review found that there was more research focused on learners with SEN rather than on those who may be at risk of exclusion for other reasons; however, in a refrain that will become familiar, the authors noted that much of the research consisted of small-scale studies and curriculum development publications.

The inclusion team at Becta have been very influential in the development of understandings related to ICT and inclusion. They have done this through conference input, by writing sections for many of the books referred to in this report and sometimes by members of the team producing influential publications (McKeown 2000). In her short book, McKeown's text forms a link between earlier technologically-determined studies and later work based on whole-school and inclusive approaches. Although structured in a traditional way, with much reference to key software titles, the textual commentary recognises the limitations of some technologies and the vital importance of appropriate pedagogical approaches. Similarly, key texts of recent years have focused much more on teacherly practices – pedagogies – than on case studies of specific technologies in use. This is not to say that there is no role for case studies and their use can be a way of ensuring that an edited compilation

carries credibility in addition to assertion (Abbott 2002c). For example, one editor has sought to place those teacherly practices within developing theoretical frameworks by placing the experiences of the British Museum web team as they seek to include all learners (Howitt and Mattes 2002) and the daily practices of innovative teachers and advisers (Paveley 2002; Ware 2002), alongside statements of policy and developing theoretical frameworks (Abbott 2002a; Phelan 2002; Stevens and Waller 2002).

People who are labelled as having learning difficulties have themselves begun to contribute to the literature on the topic. This growing body of literature features for the first time the voices of people with learning difficulties (Armstrong 2003; Atkinson, Jackson and Walmsley 1997) and it is to be hoped that future such publications will also discuss the authors' use of ICT, which is our current focus. The process of "tempering official and 'objective' accounts of the past with the memories and experiences of the people" involved (Atkinson et al 1997, p2) is both vital and enlightening. The increasing involvement of people with learning difficulties in technology companies is another way of combating their "disempowerment and... the denial of their voice in decisions relating to their lives" (Armstrong 2003, p124). This emerging possibility also extends to the parents of young people with learning difficulties; although inter-agency working is still rare, it is occasionally the case that work with parent partnerships has led to parental involvement in research, as was the case with an overview of Assistive Technology completed in the US (Jeffer, Behrmann and Bannan-Ritland 2006).

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# CURRENT AND HISTORICAL UNDERSTANDINGS OF LEARNING DIFFICULTIES



## 1.4 SUMMARY

Before engaging with the evidence generated by this research, therefore, one of the key findings of this review is the need for a more mature and established field of research in the area of digital technologies and learning difficulties, one in which research is connected with a wider theoretical understanding of learning in social contexts and with digital technologies, rather than constrained to the evaluation of the efficacy (or otherwise) of particular tools, and one which is itself more inclusive of the accounts of those who are themselves labelled as having learning difficulties.

## 2 CURRENT AND HISTORICAL UNDERSTANDINGS OF LEARNING DIFFICULTIES

The history of learning difficulties is a complex one (Brigham, Atkinson, Jackson, Rolph and Walmsley 2000) and includes developing and changing understandings and terminology (Thomas and Vaughan 2004) which themselves impinge on and often shape our understanding of how digital technologies may play a role in learning.

Until relatively recent times, an inability to learn or a marked slowness in learning has been seen, in one way or another, as a defect internal to the learner so described. This has often been reflected in the terminology used. It seems unbelievable to us now that the use of terms such as imbecile ("incapable of managing themselves or their affairs"), feeble-minded ("require care, supervision and control for their own protection") and idiot ("deeply defective in mind from birth") were seen as the outcome of enlightened legislation in the late 19th century (Great Britain 1886). Similarly, and much more recently, terms such as maladjusted, educationally subnormal and crippled were often thought to be neutral by teachers entering the profession in the 1970s.

These terms were given quasi-scientific credibility by being linked to IQ test scores which were an accepted construct at the time as an accurate and immutable measure of potential. Indeed, until the 1970s, allocation to a special school was a direct outcome of the result of an IQ test; the test score decided if a pupil was educationally subnormal (and the degree of this subnormality), or, presumably, 'normal'. These categories of pupils were

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this social model of inclusion recognises that learning can only take place if the appropriate context has been created

then put into different schools where they would be taught alongside others with similar IQ test results.

While no longer reliant upon the outcomes of IQ tests, the pathologising (Billington 2000) – or labelling – of learners with special educational needs was a feature of the original version of the 1994 Special Educational Needs Code of Practice (DFE 1994). This Code of Practice enshrined in law key categories of need which were becoming accepted at the time, including gradations to measure levels of need, such as moderate learning difficulties (MLD) as opposed to severe learning difficulties (SLD).

Recently, however, we have seen a far-reaching change in the understanding of people who are not learning effectively. This has been characterised by a move away from the medical model of learning difficulties ("this child has learning difficulties") to the social model ("this classroom/school is set up in such a way that it is difficult for all children to learn") and a focus on the teacherly practice that can bring this about (Abbott 2001).

A growing awareness of the ways in which learning is socially situated (Wenger 2000) has led to an understanding that learning difficulties can be created or fostered by inadequate teaching, inappropriate pedagogy or insufficient resources. This social model of inclusion recognises that learning can only take place if the appropriate context has been created. Deficiencies are no longer seen as solely located in the individual learner nor, as in previous uses of now-disputed concepts such as IQ, are they understood as fixed and immutable.

This change in understanding is reflected in the very different categories in the

current SEN Code of Practice (DfEE 2000) and in more recent legislation (DfES 2004). In these documents, much more attention is paid to the context in which learning takes place, and the extent to which this can support or minimise learning opportunities.

The most recent 2000 SEN Code of Practice rejects the seven categories of need found in the 1994 version in favour of four broad areas which can be summarised as interaction, cognition, social and sensory. This is a partial recognition of the social model of inclusion, and this process continues in the most recent substantive statement from the DfES; its very title ('Removing Barriers to Achievement') indicative of this change:

*"Inclusion is about much more than the types of school children attend: it is about the quality of their experience; how they are helped to learn, achieve and participate fully in the life of the school. (DfES 2004, p25)*

This history of language, understanding and terminology has been reflected in (and has influenced) the debates over the relative merits of withdrawal or support when attempting to improve the learning opportunities of all pupils, together with the linked issue of separate or inclusive schooling. The development of separate special schools, from their beginnings in the late 19th century to their heyday in the 1970s, led to a culture of special education, namely, special provision for those deemed to be different. In 1994, UNESCO persuaded most countries to sign what has become known as the Salamanca Declaration; an intention to move, as quickly as possible, towards unified education for all (UNESCO 1994).

Movement since then has been halting and minimal in all but a handful of countries, although a recent UN Convention on the Rights of People with Disabilities (December 2006) has now been adopted and is awaiting signature ([www.un.org/esa/socdev/enable/index.html](http://www.un.org/esa/socdev/enable/index.html)).

In the UK, a key theoretical contribution to this process was the report of the 1978 committee chaired by Warnock (DES 1978). It was the Warnock Report that brought the term **special educational need** into common currency, together with the perception that this term could be applied to around 20% of the school population at some point during their education. Following the Warnock Report, movement towards inclusion was slow. In the UK, numbers of special schools began to decline during the 1980s and 1990s. This process came to a halt by the turn of the century, mostly as a result of "the conflicts between 'inclusive' education, the league tabling of schools and the testing and examination culture" (Rogers 2007, p56). At a time when schools can be closed and headteachers induced to resign as a result of a drop in test results, it is hardly surprising that many schools are reluctant to welcome pupils who find learning difficult. In 2005, it was once again Warnock who authored one of the key theoretical statements arguing for a retention of special schools in the very different climate of the last few years (Warnock 2005) and this was followed by a collection of articles arguing to varying extents for the necessity of some level of separate schooling (Cigman 2007).

The debate around separate as opposed to inclusive schools is also linked to the growth of medically-oriented categories of learning difficulty such as dyslexia

(sometimes known as specific learning difficulty), Attention Deficit Hyperactivity Disorder (ADHD) and Asperger's syndrome. These perceived conditions, sometimes treated by drug therapy as can be the case with ADHD, have led to a culture of expectation of specialist treatment by trained individuals, a process which itself sometimes leads to education through withdrawal if not separate schooling.

This approach is challenged by some commentators. Billington, an educational psychologist, for example, promotes "less oppressive ways of seeing children" (Billington 2000, p116), and uncompromisingly argues for an end to categorisation of all kinds. There are, moreover, others who suggest that labelling and categorisation is not just a linguistic process. Ainscow, for example, argues that the provision of learning assistants may be creating division (Ainscow, 2000) which prompts consideration of whether the same could also be true of designated technology use attached to one individual. Billington and others (eg Rogers 2007) identify categorisation, ranking and league tables as actively acting against progress towards inclusion. Such perspectives, however, have been slow to leach down to practitioner books and advice given to teachers (Wilson 2000), although whole-school approaches are now more common (Cowne 2003; Tilstone and Layton 2004; Westwood 2003).

This uncompromising social model, particularly where it relates to disability, has, however, attracted some criticism:

"[In the social model] Disabilities have to be social constructions only – barriers



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created by society's inability to take account of people it perceives as having impairments. By contrast, impairments are biological characteristics of the body or mind... I worry about this return to mind-body dualism... [which has worked]... to the disadvantage of people with severe intellectual and communicative disabilities. (MacKay 2002, p161)

However, arguably what MacKay is actually criticising in this paper is not the social model of inclusion, but inadequate and uninformed responses to it that have emerged in particular political circumstances.

It has also been suggested, often from an educational psychology perspective (Farrell 2004), that a laudable desire to avoid labelling (and the production of self-fulfilling prophecies that this can engender) may lead to deficiencies in identification and assessment. The language of debate differs too; where social scientists talk of the social model of inclusion, psychologists like Farrell will be concerned with whether special educational needs are biologically or socially determined.

## 2.1 SUMMARY

While still subject to significant debate, the shift to a social model of inclusion must be seen as an important corrective to a medical model which predetermined many young people to lack of achievement in education, and which assigned that lack of achievement to children's own deficits rather than a failure of the educational environments to support them to learn. How we balance medical and social accounts of learning difficulties is likely

to remain a 'live' topic of debate for some time to come, as it is in wider debates in the social sciences and studies of childhood more generally (see, for example, Prout 2005).

Notwithstanding this, the shift in perspective to engage with a social model of learning difficulties encourages an engagement with improving and diversifying the contexts (social, material and cultural) in which all children can be enabled to learn. As has been suggested (Daniels 2000), the challenge is to go beyond the rhetoric and achieve real change. As such, the social model is particularly relevant to our consideration of how digital technologies might be used to enable e-inclusion.

# A TAXONOMY OF E-INCLUSION



## 3 A TAXONOMY OF E-INCLUSION

E-inclusion – the use of digital technology to assist those who find learning difficult – is an under-theorised area which has developed piecemeal over the last 30 years. In order to attempt to create a structure within which to investigate the research to date and in order to keep the needs of people with learning difficulties in mind, this section of the review proposes three broad categories of e-inclusion.

The first category is the use of **technology to train or rehearse**. Much use of technology in the 1980s and early 1990s fits into this category, as does far too much later and current use as well. Although such technology has its place, that place should be in the background and only when needed; too often this technology has taken centre stage. This type of e-inclusion is often associated with a behaviourist model of learning.

A second category of e-inclusion involves the use of **technology to assist learning**. This brings to mind the term assistive technology, but use of this term is problematic since it is differently defined in various contexts. As used in this paper, technology that assists is usually linked to the need to compensate for a physical disability or difficulty. For example, someone who is unable to speak may be able to take part in a discussion by using a speaking device. This device is therefore assisting the learning to take place but is not a catalyst for the learning itself. The use of technologies in this way is also usually not related to a specific theoretical model of learning; it is an adjunct to learning rather than the key agency through which the learning takes place.

The third category, and one which describes far less classroom practice than is sometimes claimed, is the use of **technology to enable learning**, where the use of technology makes learning possible where it was not possible before. In this case, the technology may be mobilised in an active role in the learning process: perhaps by asking questions, intervening in an activity or presenting interactive scenarios or simulations. This might involve the use of technologies to facilitate the creation of collaborations and communities where learners work together, an approach more often associated with social-constructivist models of learning, and engaging more specifically with learning in social contexts and learning through collaboration and interaction with other people. Crucially however, the significant difference between this categories and the other two is that it is only through the use of technology, albeit in a collaborative or supportive context, that particular learning can take place. The use of technology transforms rather than modifies the learning context.

It is worth pointing out that the understanding of e-inclusion identified in these three categories is linked to a series of phases which have tended to follow theoretical developments in the field of learning, and learning with digital technologies, after a considerable interval. Indeed, much educational software that has been developed in the last 20 years has seemed to belong to an earlier era of thinking about theories of learning. In general, e-inclusion in Western Europe has been more closely linked to a growing understanding of constructivist learning than have been some of the mass-market solutions produced in North America, as will be shown below.

# A TAXONOMY OF E-INCLUSION



The remainder of this section talks through these different approaches to the use of technology for e-inclusion.

## 3.1 USING TECHNOLOGY TO TRAIN OR REHEARSE

There is a long history of the use of technology within educational settings to help those who are struggling. Those old enough to remember teaching in the 1960s and 1970s may also remember a range of devices based on audio recording technology. These ranged from a flash card reader which enabled a single word to be read aloud, to the audio page where an A4 sheet could carry images or text on one side whilst the reverse was used to store magnetically a few sentences. These devices were developed for two main reasons: the availability of improved magnetic storage of audio and the perceived relationship between phonics and reading. In most schools, these devices were seen as specialist tools to be used by expert teachers, usually linked to what was called the Remedial Department, and not available to other classroom teachers.

The major use of technology to train and rehearse has been through drill and practice software, and this still has a significant presence in the marketplace although a declining one in most educational institutions. It is hardly surprising that drill and practice software has had far greater impact in the special educational needs sector than elsewhere in education. With the medical model in the ascendant, the 1980s and early 1990s were the heyday of such software.

Similarly, the expectation at that time was that special schools needed special software. As an example of this, when all London schools were provided with packs of software by their local authority, these packs were produced in three different versions: primary, secondary and special. There was even a special word processing program, quite different from the industry standard programs now in use, and designed to be used solely by those who found writing difficult. It used word banks and other support but pre-dated the more useful tools such as text to speech and symbol support that were to follow<sup>1</sup>.

The drill and practice phase of e-inclusion reached its summit in the UK in the early 1990s with the rise of Integrated Learning Systems (ILS). There are different definitions of ILS but in most cases the term is taken to mean a set of learning activities, often related to literacy and numeracy, and offered together with a diagnostic tool. Students take the tests set by the system and are then offered individually-tailored activities to meet their perceived needs. The systems are usually much more expensive than other software but they contain many hours of activities and complex reporting and tracking tools to inform teachers. Whilst advocates of ILS point to them being 'teacher-proof', a term used in the US advertising for a market leader but not when the same product was sold in the UK, critics of this way of working are concerned by the apparent sidelining of the teacher.

ILS products were developed over more than 25 years, predominantly in North America, and were brought to the UK after a government delegation visited the USA

<sup>1</sup> It is interesting to note in passing that the only program included in all three packs, a text rebuilding program based on socially collaborative learning, is the only one still available today, albeit in an enhanced form.

there is a long history of the use of technology within educational settings to help those who are struggling

and elsewhere and saw them in use (NCET 1993, 1994a, 1994b). A series of government reports indicated the limits to what could be expected from these products, but the supposed, although often unproven, link between their use and improved test scores, much promoted in some tabloid newspapers, ensured their survival at least for a few years (T Detheridge 1994). Later government reports were much less positive and suggested diminishing returns over time, and researchers began to express grave doubts about their efficacy (Underwood 1994; White 1992). When these were followed by the results of independent research rather than that funded by manufacturers with vested interests, often by the same researchers who had been involved in the funded research, it became clear that ILS was not the panacea it was once claimed to be (Becker 1992a, 1992b; Maddux and Willis 1992).

Surprisingly, the topic was still considered worthy of a chapter (Hedley 2004) in a recent publication focusing on ICT as a tool for inclusion (Florian and Hegarty 2004). In his chapter, Hedley considers ILS not just as a learning tool but as a mechanism for raising self-esteem. Hedley acknowledges that there is no evidence that ILS increases achievement, and his own perspective as a teacher in an ILS-using school is a valuable one. His anecdotal evidence of the diminishing effect over time and, in some cases, regression of that effect, is mirrored in much of the literature. Hedley's discussion of self-esteem raises some important issues, although it could be argued that self-esteem can be raised in other ways. His conclusion is that an ILS can "form a central part of a school's special educational needs provision but it should always be just that, part of a wider set of resources" (Hedley 2004, p77).

Perhaps the final word on ILS should come from Lewis's closely-argued paper examining the UK evaluation which recognises the impossibility of separating those learning outcomes linked to ILS from those related to, or produced by, other aspects of pedagogy (Lewis 1999).

Rather more surprising than the 1980s enthusiasm for drill and practice software is the realisation that such software still has a firm hold in the special educational needs market even after it has lost most of its credibility within the mainstream. This might seem surprising in view of the much greater understanding now current among teachers regarding the value of different kinds of software. However, it is important to note that much drill and practice software is sold not just in educational catalogues but in high street outlets, with parents and supplementary schools as additional purchasers.

ILS does not constitute the only approach to using technology for training and rehearsing, however. One focus has been the use of the spoken voice to prompt, rehearse or remind. Speech synthesis has been a focus of interest from the mid-1980s (Roston 1992), and it is striking to note the extent to which speech generated by a computer has improved today. This has enabled the production of programs with vastly-improved speech in so far as clarity is concerned, but this has not always been accompanied by an equivalent improvement in efficacy of learning.

Another focus since the 1980s has been virtual reality (VR) and multimedia (Brown 1993; Cromby, Standen and Brown 1996; Mechling, Gast and Langone 2002). A number of teams investigated the extent to which VR could enable people with learning difficulties to interact more



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effectively with a computer simulation, or to use computer-based media to prepare for real-life activities. These types of media have also sometimes been used because the topic in question – such as sex education – was not suitable for real-life experience (Lee, McGee and Ungar 2001) in the classroom. A frequent criticism of some of these developments has been the suggestion that a more effective learning experience could be offered through a real-life visit to a venue rather than a VR one.

The full potential of virtual reality for e-inclusion remains unrealised, although recent work with people with autism has showed some benefits for developing imaginative play following the use of VR scenarios (Herrera, Jordan and Vera 2006). The researchers set up shop and classroom scenarios and found that students with autism began to play more imaginatively after using these.

## 3.2 USING TECHNOLOGY TO ASSIST LEARNING

Although the focus of this review is those learners who find learning difficult, many of the e-inclusion solutions discussed here are also shared with, or similar to, those adopted by people characterised in other ways. People who use Alternative and Augmentative Communication (AAC) were amongst the earliest users of e-inclusion devices, often in the form of technologies allowing them to participate in discussion, make their views and wishes known and to become literate. AAC users often do not have learning difficulties but may make different use of the same technologies that are used by people with LDD. Professor Stephen Hawking, for example, is perhaps the most high-profile AAC user in the UK,

but he would certainly not be labelled as having learning difficulties.

One area of overlap between some AAC users and people with learning difficulties is the use of graphic symbols for communication and literacy. Although symbol use pre-dates digital technologies and has a long history, it is only through symbol software and symbol-enhanced communication devices that this practice has become so widely disseminated. As recorded in a series of publications (Abbott 2000; Abbott, Detheridge and Detheridge 2006; M Detheridge and Detheridge 1997, 2002), digitally-based symbol use has developed from simple word-picture correspondence to a set of much more complex practices and capabilities. A more recent publication (Abbott et al 2006) reflects upon the progress made with symbol use through the availability of desk-top publishing programmes, word processors and web browsers which make use of graphic symbols, and notes the widening of the groups making use of them. Symbol use has been widely discussed within the AAC literature, a well-researched field which supports a peer-reviewed international journal. AAC-based research, however, understandably focuses on communication needs rather than digital technology use, but those charged with supporting people with learning difficulties would do well to be aware of this body of research.

Another overlap is with the field known as Assistive Technology (AT), as has been acknowledged above. In the past, this term has often been used to describe the use of e-inclusion following an accident, illness or loss of movement. In this sense, it has sometimes been bracketed with rehabilitation engineering. More recently, Assistive Technology has become a more

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general and widely used term, and this may continue in the future. Assistive Technology has been defined as "the software and technology which helps people with disabilities and special needs to overcome the additional barriers they face in communication and learning" (Becta 2003, p3). This is a very wide definition but can be contrasted with the even wider one adopted by the Foundation for Assistive Technology (FAST): "any product or service designed to provide independence for disabled and older people" ([www.fastuk.org](http://www.fastuk.org)). AbilityNet, a UK charity working in this area, defines AT as technologies that improve "opportunities and independence for students with SEN, leading to real inclusion" ([www.abilitynet.org.uk/education](http://www.abilitynet.org.uk/education)). HumanITy ([www.humanity.org.uk](http://www.humanity.org.uk)) is another UK-based organisation that has worked for ten years in the broad area of e-inclusion but with a particular focus on, and background in, broadcasting.

Switch access is well established, although still under-researched, with much of the literature dealing with switch use in everyday life rather than specifically for learning (Lancioni et al 2002). Switches are usually simple round buttons that can be pressed or levers than can be operated by movement of the head or other body part. Clicking the switch has the same effect as moving the mouse, clicking a mouse button or selecting a letter on the keyboard; as a result, switch control of a computer can be very time-consuming, but for some users it is the only route to relatively independent control. Innovative software can enable switch users to develop surprisingly rapid text output; Dasher ([www.inference.phy.cam.ac.uk/dasher](http://www.inference.phy.cam.ac.uk/dasher)), for example, uses prediction, colour and movement to enable writers

to output up to 39 words per minute with a single switch or up to 29 words per minute with eyetracking.

Since the 1990s, the focus has been on the gradual reduction of the wide range of software and the rapid development of extra features in some key programs. In some cases, this may be the same software that is used in mainstream settings but with added facilities, as with the addition of speech to a standard word processor. Some manufacturers produced modified versions of standard office applications, with some features omitted or hidden. Interestingly, some of the best software intended for the special educational needs market is now also to be found in many mainstream schools. This is particularly the case with two of the market leaders: a suite of symbol-supported programs (the Widgit Literacy programs from Widgit) and a series of programs making use of on-screen selection grids (the Clicker programs from Crick)<sup>2</sup>. These were all originally developed for particular learning difficulties situations, but they have migrated into the mainstream settings where they are now to be found. Both these companies have worked with researchers for many years to understand user needs and to mediate between teachers and developers, rather than using those researchers to evaluate possible links between software use and educational attainment.

Within wider European circles, a particular drive within the European Union relates to e-accessibility and the propagation of technology solutions within the EU as part of the i2010 initiative. A recently published collection (Roe 2007) summarised some of the key developments, but the majority of



<sup>2</sup> [www.widgit.com](http://www.widgit.com), [www.cricksoft.com](http://www.cricksoft.com)

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there are no longer strong barriers between products aimed at this supposed group and those aimed at the mainstream

these were related to aspects of sensory impairment or electronic communications. A few contributors did consider learning difficulties however, and it is interesting to note that some technologies developed to assist those with sensory impairment may be repurposed for other disabilities. Handheld devices that help blind people to know where they are, for example, are now being used in pilot research to assist people with learning difficulties in Gothenburg, Sweden, to become more independent when away from home (Lindstrom 2007).

By the present day, one of the most marked changes in digital technologies for people for assisting learning has been that there are no longer strong barriers between products aimed at this supposed group and those aimed at the mainstream. It is now far more likely that young people with learning difficulties will be using standard software or hardware but with extra facilities built in. This could be in the form of an alternative keyboard or mouse, a restricted set of options or a new support facility not normally to be found on a menu. One example of this is the filter developed in Spain that removes tremor effects on the mouse cursor, a source of difficulty to some users (Rocon, Miranda and Pons 2006).

Much of the current emphasis is on the use of generally available tools in ways which make them accessible to all users, or which pair devices together to create new synergies. An example of this is the use of handheld text-reading pens to enable people with learning difficulties to use the web more easily (Harrysson, A Svensk and Johansson 2005) or the use of ambient and other mobile technologies (Hasselbring 2001; Woerden 2006). Hasselbring (2001) looked forward to a

future where the use of handhelds – what he termed ubiquitous computing, although that term has many definitions – would become second nature for people with learning difficulties. Tinker (2001) shared the emphasis on mobile computing but focused more on the applications that could be developed specifically for this target group (Tinker 2001). This focus on mobile technology is part of a wider trend which also includes, for example, publications which suggest that the computer itself can be seen as a tool for inclusion (Brodin and Lindstrand 2004), both in the school and, perhaps even more importantly, in the home (Lindstrand 2002). Access to mobile technology is seen by these writers as an equity issue, with the assistance provided by the technology seen not as an add-on but a basic human right.

One of the most recent publications to focus in particular on the use of ICT by children designated as having special needs (Florian and Hegarty 2004) makes a convincing case for its use as a tool for inclusion. For the most part, the chapter authors in this publication focus on assistive technology and the use of ICT for assessment and early identification, but one chapter looks at the use of virtual environments by pupils with learning difficulties (Standen and Brown 2004). In their aim to offer control by the learners and active learning throughout, the authors show their recognition of the needs of all learners.

The key current perspective in much of the literature is the role of technology in assisting students with learning difficulties as they are increasingly included in mainstream education. This leads to a debate around the provision of appropriate technology, technology which tends to be found at present in special rather than

mainstream schools. In the past, the UK has funded technology from education budgets and placed it with local authorities or agencies supporting schools, who then loan it to individuals. This is in contrast to the system in many European countries, particularly in the Nordic region, where technology that is necessary is funded from health budgets and becomes the property of individuals. The UK Cap Project ([cap.becta.org.uk](http://cap.becta.org.uk)) ran from 2002 to 2006. For the first time in the UK, this project allocated technology to individuals. Despite the official evaluation and users having indicated the success of this approach (Wright et al 2006), the funding has now ceased and there is no indication to date of a follow-on project or indeed any way of maintaining and updating equipment issued by CAP<sup>3</sup>. Plans are developing, however, for assisting people with learning difficulties to use the internet through the DfES Cybrarian Project ([www.dfes.gov.uk/ciogroup/myguide.shtml](http://www.dfes.gov.uk/ciogroup/myguide.shtml)), although this is only at pilot stage.

### 3.3 USING TECHNOLOGY TO ENABLE LEARNING

Arguably, the previous two approaches to e-inclusion could be said to have prioritised technology over learning. And indeed, this has been one of the major risks in theorising the role of digital technologies in e-inclusion debates in education – that the focus moves away from what we understand to be the most effective means of teaching and learning with digital technologies, towards an unhelpful view of technology as ‘in itself’ offering the ‘solution’ to learning difficulties.

This third category, ‘using technology to enable learning’, takes a different perspective. It argues that while technologies are tools for learning and enablers of learning, it is only learners who learn; and learning happens in a rich social and cultural context in which teachers, more expert others and peers play an important role. This category offers at once a more complex and more modest view of the role of technology in e-inclusion and locates it within an understanding of distributed cognition which focuses on the interaction between person, technology and environment.

This is not a new understanding and such reservations can be found throughout the literature, although such voices have not always been heard. Consider, for example, McKeown’s realistic and positive discussion of the potential of the use of technology by people with dyslexia:

“Technology will not provide all the answers to the problems of specific learning difficulties but it can be effective in reducing the number of hurdles that children have to cross at any one time.”  
(McKeown 1992, p100)

While Hegarty (1991) remains important for its focus on the future, and its early recognition of such trends, Hawkridge and Vincent (1992) put forward a more cohesive and closely reasoned argument for the use of computers by people with learning difficulties, which recognised the limits of technological determinism in this field:

“Computers can ease learning difficulties. They can help learners to overcome their difficulties. They cannot work magic. They

learning happens in a rich social and cultural context in which teachers, more expert others and peers play an important role

<sup>3</sup> On a related matter, it has been suggested that ICT can enable special schools to become resource centres (Abbott and Cribb 2001; Abbott and Galloway 2003), but this aspect of ICT use for inclusion is outside the remit of this publication.

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are not necessarily the best solution. Because each learner's needs are slightly different, there are few standard rules." (Hawkrigde and Vincent 1992, p21)

In the concluding section of their book the authors look forward by considering "the users of the technology, their teachers and the support required to make effective use" (Hawkrigde and Vincent 1992, p220). This recognition of the importance of pedagogy and training, in addition to resources, has proved to be far-sighted. For example, only last year, those involved in the recent Communication Aids Project echoed many others in identifying the need for appropriate pedagogical practices if technology devices are to be of real and lasting benefit (Wright et al 2006).

These perspectives, then, foreground the need to pay attention to the role of teachers, and others, in creating the conditions within which digital technologies can be appropriately and effectively used to support e-inclusive practices. This is a far cry from the 'teacher-proof' claims attached to ILS. Similarly distinct from ILS behaviourist models has been the adoption of constructivist and socio-cultural theories of learning within e-inclusion debates.

For example, constructivist theories of learning stimulated truly innovative developments such as Developing Tray (the text rebuilding program) (Stephens 1985) and Logo, the innovative programming language developed by Seymour Papert and others at MIT in Boston – both examples of technology that can enable learning. These led to a range of original and worthwhile subsequent applications. By the time that Blamires (1999) was published, the use of digital

technologies was frequently seen within a constructivist framework. Once again, the title of the book ('Enabling Technology...') was an indication of changing understandings. Although the term enabling technology has not proved to be long-lasting, the definition given by the author is worthy of mention:

"The creative and sensitive application of appropriate technology in order to improve the quality of life of individuals and their range of life opportunities." (Blamires 1999, p1)

Importantly, the focus of this text has shifted from a structure based on categories of difference to one based around aspects of socialisation and physical engagement. Noting the increasing importance of inclusion, the editor remarks that "the successful educational use of technology also requires rigorous thought about learning" (Blamires 1999, p113).

Around the same time, other writers who were to become highly respected voices in the field made the first attempts to propose theoretical frameworks for the use of ICT by and with people with learning difficulties. In a tightly argued account of the processes involved in communication (T Detheridge 1997), significant barriers are identified. These barriers included the focus for the most part on direct communication rather than literacy, the pace of change in symbol use and tools, ethical problems related to establishing a non-symbol-using control group who would be denied access to literacy, and the changing focus of research funding. In the same book, a small-scale study showed clear benefits from involving users in the design of symbols. It is disappointing that

no further researchers appear to have developed this work.

One emerging underpinning understanding within the use of technology to enable learning is the considerable potential that digital technologies have to support collaborative learning. This is not a new concept, and the research evidence regarding such collaborative learning has a lengthy history. As was suggested more than ten years ago:

"Socio-cultural theory provides a persuasive framework for thinking about teaching and learning... [and] a distinctive perspective on the relation of technologies to education." (Crook 1994, pviii)

This potential is being explored by those beginning to use the internet for e-inclusion practices. In a paper (Banes and Walter 1997) which predates the book on a similar topic by the same authors (Banes and Walter 2000), the headteacher and IT coordinator of a special school display their recognition of the potential of the internet only two years after the world wide web was invented, a recognition which predated that of many of their mainstream colleagues.

These developments, together with innovative technological advances, are leading to a second wave of e-inclusion which is collaborative rather than individualist, holistic rather than skills-based and inclusive rather than separatist. Technology can enable learning but does so without necessarily taking centre stage; paradoxically, it may be the most subtle and background uses of technology that are the most transformational. E-inclusion has come of age.

### 3.4 SUMMARY

Our aim should always be to ensure that appropriate technology is available for all at the point of need to enable and enhance learning in the most powerful ways possible. In two linked publications (Nind, Rix, Sheehy and Simmons 2003; Nind, Sheehy and Simmons 2003), Nind and her co-authors discuss in depth a range of perspectives on inclusive education and the learning contexts in which it can take place. They address ICT specifically in only one chapter, but there are telling ICT-related moments in some of the other accounts included. The reader is struck, for example, by the comment in an extract from the unpublished autobiography of a person with learning difficulties:

"Using a computer led me... to begin living on my own without always needing my mother around." (Chappell 2003, p31)

The use of technology to enable learner agency and independence; the use of technology to enable access to powerful learning experiences whether through collaboration, construction or rehearsal and training; the use of technology to complement and respond to the rich social settings in which learners find themselves - these are some of the opportunities that open themselves up now for exploration in the field of e-inclusion. This review offers a view of the role of digital technologies in e-inclusion practices that is at once much richer and more modest than that which has sometimes preceded it. In many ways, it seems we are now beginning to learn the lessons from earlier studies and are in a position to take the whole area forward significantly.

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# FUTURE DIRECTIONS, OPPORTUNITIES AND CHALLENGES



## 4 FUTURE DIRECTIONS, OPPORTUNITIES AND CHALLENGES

### 4.1 FUTURE RESEARCH AGENDAS

Issues of agency, identity, power and culture, familiar topics in disability studies scholarship, are almost invisible in the emerging and sometimes simplistic research literature on inclusion in the educational system. This is partly because of the direction of funding towards short-term practitioner research, but is also a reflection of the disjunction too often to be found between teachers and researchers. Teacher-researchers working towards inclusion are often less familiar with the writings of Riddell and others than they are with the SEN Code of Practice and the workings of SEN tribunals. By the same account, researchers often publish in what could be seen as a special needs ghetto which will of necessity limit the audience, rather than in volumes aimed at the whole of education, although some have been aware of this and have attempted to write more widely (Abbott 2002b; Snyder 2002).

Self-advocacy is perhaps the topic that will bring these divergent groups together, and users of symbols and their supporters are already beginning to coalesce around this subject. The self-advocacy movement has grown as a result of the efforts of disabled people who have consistently challenged the assumptions made about them. Too often, although not surprisingly, their challenges to the school system have come only many years after they have left it. Their experiences of schooling have often been stories of institutionalisation, resulting in low self-esteem and loss of identity (Goodley 2003; Soto 1997). The call for others to "embrace and theorise

resilience whilst challenging analyses that may actually recreate victims of disablement" (Goodley 2003, p128) may have been written about adults described as disabled, but could be an equally valid call to teacher researchers.

Researching the effectiveness of technology to support learning by those defined as having special educational needs is essentially no different from researching the needs of all other learners. The demons of technological determinism and cyberbole loom just as large, and the trapdoors for the unwary reader open just as wide. At the same time, the process of reviewing the literature in this field leads to a clear understanding that there has too often been a time lag between the theorisation of learning with digital technologies in general and that in the field of e-inclusion. This has, at least to some extent, limited the richness of discussion in the field. As the debates on mainstream or separate education have raged in the field of learning difficulties, so we may need to explore the potential of 'mainstreaming' theorisation of e-inclusion in order to ensure that it draws on the rich research strands in learning with ICT in evidence, for example, in emergent programmes of work such as the ESRC/EPSRC Technology Enhanced Learning call.

Moreover, frameworks such as that developed by Fisher, Loveless et al (2006) also offer a rich basis to begin to theorise the role of digital technologies in creating inclusive learning environments by identifying four clusters of affordances: knowledge building, distributed cognition, community and communication, and engagement. All of these should be viewed as goals for learning experiences for all

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children, and consideration of how to achieve these learning practices should not be denied to children with learning difficulties. At the same time, frameworks such as activity theory and actor network theory in studies of childhood and technology, and technology and learning, may offer fruitful ways of theorising the relationship between social models of inclusion and digital technologies, and new takes on the debates between social and medical models of inclusion.

As well as theoretical debates, there are some pressing empirical questions in the research field; knowledge about the extent of e-inclusion activity is lacking, since much of the statistical data that has been collected relates to numbers of computers rather than modes of use (DfES 2002). We know that there is widespread ICT use within special needs settings, but research from Australia suggests that the problem may not be lack of use but under-use of ICT (Seymour 2005); it is used, but it is not used as effectively or as much as it might be.

If this is the case, and much of the literature in the review would suggest that it is, the indication is that the need for the future is more training rather than more technology, and it is relevant to note that the SEN-focused version of the National Lottery-funded training of all teachers to use ICT met with greater approval than that for most other topics. However it is to be achieved, the future for e-inclusion must revolve around improved understanding on the part of teachers as much as on provision of new, enhanced or more numerous technologies.

## 4.2 FUTURE POLICY REQUIREMENTS

For a vision of e-inclusion to develop which is rooted in pedagogy and communities of learners, rather than in technological determinism, as is called for in the literature discussed above, the need is first for a **documented national understanding** of some of the key benefits, affordances and reservations attached to the informed use of digital technologies to assist those with learning difficulties. Such a pedagogical statement would enable developers to prioritise future activities, policy makers to plan for development and, most importantly, teachers to make more selective and effective use of the technologies at their disposal. The production of such a common understanding could be a key task for the group set up by Becta and DfES to discuss inclusion within the development of personalised learning<sup>4</sup>.

The next stage in the process is the incorporation of this shared understanding into **initial and continuing teacher education**. This represents particular challenges for those involved in initial teacher education, where the UK model of a typical one-year post-graduate training is at variance with much of the rest of the world. However, recent moves to enable parts of that training to be accredited at Masters level may provide a way forward and a link to continuing professional development.

**Continuing Professional Development** (CPD) is key to developing and enhancing understandings of e-inclusion and has not been a major priority for schools in recent years. There are few specific courses covering e-inclusion and those that do exist may be aimed more at therapists or



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<sup>4</sup> schools.becta.org.uk/index.php?section=lv&catcode=ss\_lv\_lp\_03&rid=12939

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rehabilitation experts than at teachers, but this area is changing and Masters courses in aspects of e-inclusion are beginning to emerge. The focus on e-inclusion which forms part of the European Union Framework 7 for research (2007-2013) will also be influential in this area.

What is clear is that the provision of hardware-driven schemes, such as the attempt over the last few years to put large numbers of electronic whiteboards into UK schools, is unlikely to lead to lasting change in e-inclusion practices. Indeed, there are practical challenges for inclusive schools in that only one of the current brands of whiteboard can be lowered to enable wheelchair users to access it. A recent evaluation of interactive whiteboards commissioned from the Institute of Education and published by the DfES (Moss et al 2007) showed that only a very small minority of teachers had received training in the use of this technology with students with learning difficulties, even where they had received training in other aspects of its use. In particular, the researchers noted the need for clear pedagogical understanding in order for meaningful change to take place in classroom practices.

*"When use of the technological tools took precedence over a clear understanding of pedagogical purpose, the technology was not exploited in a way that would or could substantially enhance subject learning... the focus on interactivity as a technical process can lead to some mundane activities being over-valued." (Moss et al 2007, p9)*

Technology is a permanent part of our educational lives. Indeed, a recent paper from Canada (Ryan 2006) described in

some detail the lives of those young people who may be technologically dependent because they are medically fragile, with td/mf now becoming a recognised term in the country. For the young people discussed in the paper the computer that enables them to write is as vital – or almost so – as, for example, the dialysis machine that enables their kidneys to function. We are all, to some extent, technologically dependent; how many of us could easily return to writing without computers and dealing with the limitations of handwriting and typewriters? Indeed, it has been suggested that technology – and social networking in particular – might enable some disabled people to establish a presence which would otherwise elude them (Seymour and Lupton 2004). This development belongs to another aspect of e-inclusion: the **use of technology for recreation and other areas outside learning**, and as such is outside the remit of this publication; but teachers need to be aware of these uses of technology by the young people in their classrooms.

## 4.3 FUTURE AREAS FOR DEVELOPMENT

It has been suggested in this paper that e-inclusion can be seen to encompass **technology to train or rehearse, technology to assist learning** and **technology to enable learning**. If this division is accepted, at least for the purposes of discussion, then there are clear possibilities in each area for future development.

It seems likely that technology to train or rehearse will remain a feature of the educational terrain, at least for the foreseeable future. Although it is has been, to date, the least revolutionary or visionary

use of e-inclusion, drill and practice software programs continue to sell in large volumes and are defended by those who find them helpful. The dangers in this area are real however, and it is important to remain alert so that technology does not become the 21st century equivalent of the meaningless 'busy-book' found in many a 1970s special school classroom. What is currently under-researched, and little understood, is the potential for immersive technologies to be combined with reflective spaces and practices to offer new pedagogical models for these approaches to teaching and learning.

**Technology to assist learning** faces exciting and revolutionary changes in the near future. With non-invasive brain control of software nearing achievement (and identified for specific research funding by the European Union) it seems likely that e-inclusion will soon unlock literacy for those who may currently be immobile and possibly considered incapable of communication. Eye-gaze software is already at a well-developed stage and will reduce in price considerably over the years ahead. Put alongside switch and other interfaces, and the associated software, this will enable almost all people to interact with technology in ways that are possible for them. It is likely that much of this development will involve handheld technologies such as mobile phones or personal digital assistants, or the combined device which will replace them both. The 2006 launch of the Wii system also raises the potential of motion-sensitive control for e-inclusion. Screen display technology continues to develop too, although much of the real potential must await 3D and holographic representation, which might provide new facilities for those who use e-inclusion

devices but might also represent a new form of division. The danger is that holographic 3D images will be accompanied by an interface requiring a complex degree of motor control which may be out of reach of some users.

It is in the potential for **technology to enable learning** that the real, although less apparently exciting, developments will take place. If teachers are enabled to understand the potential – and limitations – of technology for the promotion of inclusion, and are given the appropriate resources to put this into practice, we are likely to see major developments in this area. For this to happen, there needs to be a programme of varied, appropriate and well-resourced training opportunities, experimental and sustained research and development, and the creation of digital resources to support both learners and teachers of a high quality.

This may be an apparently expensive target, but the alternative – ill-informed or inadequate use of e-inclusion technology – would be far more costly in lost opportunities and wasted resources.

it has been suggested that technology might enable some disabled people to establish a presence which would otherwise elude them

## GLOSSARY

**AAC** Augmentative and Alternative Communication – often through the use of devices that produce speech by synthesis or from a bank of recorded phrases. Some AAC users may also have learning difficulties, but many do not

**ADHD** Attention Deficit Hyperactivity Disorder

**ASD** Autistic Spectrum Disorder – the term used in preference to the simple description ‘autistic’ in order to indicate the wide range of disorders that may fall under this heading

**Asperger’s syndrome** an example of an autistic spectrum disorder that is often used to describe those who have particular specific abilities, as well as difficulties with areas such as social interaction

**Communication Aids Project** UK government funding for communication aids which ran from 2002 to 2006

**digital technologies** a general term used to describe a wide range of technologies, many of which use computers in some form or another

**e-inclusion** a relatively new term, widely used in Europe, and which can cover all aspects of the use of technology to ensure the inclusion of all members of society included. In this report, the term is used to cover the inclusion of people with learning difficulties through the use of digital technologies

**eye-gaze** the control of a computer cursor or mouse arrow through eye movement and blinking

**ICT** Information and Communication Technology

**inclusion** the process by which aspects of society, such as schools or other institutions, change so that everyone can participate in the activities on offer

**integration** although the term indicates a bringing together, integration has come to be seen within education as inadequate compared to full inclusion as a target

**language support** support, usually in the form of a teacher or teaching assistant, for a learner whose first language is not that in use in the classroom

**LDD** Learning Difficulties and Disabilities

**learning difficulties** a wide-ranging term, sometimes deemed acceptable by those to whom it is applied, and indicating a difference of pace or methodology by which some people can be helped to learn. Learning difficulties may also be created by the context in which learning takes place, so that they can be minimised or even removed if the context is changed

**learning disabilities** a difficulty with learning which is deemed permanent and which cannot be removed, but may be greatly reduced, by a change in the learning context

**medical model** the assumption that special educational needs are created by deficiencies or differences that reside in the individual

**self-advocacy** the provision of tools and support for people with learning difficulties so that they can take more control over their own lives

**SEN** Special Educational Needs

**social model** the assumption that many people are characterised as having special educational needs because society has created institutions and other settings that

produce learning difficulties where they need not have existed

**special education** separate education, often in geographically separate or even remote institutions, for those described as having special educational needs

**switch** a simple control or set of controls which can take the place of mouse and keyboard and offer a mechanism for control of a computer by hand, head, blow or other bodily movement

**symbols** in the context of this report, the graphic symbols (PCS, Widgit Literacy, Makaton, Bliss etc) used by some people with learning difficulties to increase their access to communication and literacy

**technological determinism** the assumption that technology, in and of itself, is an agent of change in society

## REFERENCES

**Abbott, C** (2001). Special educational needs: Becoming more inclusive. In J Dillon and M Maguire (eds), *Becoming a Teacher: Issues in Secondary Teaching* (2nd ed) (pp192-202). Buckingham: Open University Press

**Abbott, C** (2002a). Moving forward. In C Abbott (ed), *SEN and the Internet: Issues for the Inclusive Classroom* (pp164-168). London: RoutledgeFalmer

**Abbott, C** (2002b). Writing the visual: the use of graphic symbols in onscreen texts. In I Snyder (ed), *Silicon Literacies: Communication, Innovation and Education in the Electronic Age* (pp31-46). London: Routledge

**Abbott, C** (ed) (2000). *Symbols Now*. Leamington Spa: Widgit

**Abbott, C** (ed) (2002c). *Special Educational Needs and the Internet: Issues in Inclusive Education*. London: RoutledgeFalmer

**Abbott, C and Cribb, A** (2001). Special schools, inclusion and the world wide web - the emerging research agenda. *British Journal of Educational Technology*, 32(3), 331-342

**Abbott, C, Detheridge, T and Detheridge, C** (2006). *Symbols, Literacy and Social Justice*. Leamington: Widgit

**Abbott, C and Galloway, J** (2003). ICT: an aid to inclusion? Reflections of the potential of ICT for the changing nature of the special school. In T v Weert and R Munro (eds), *Informatics and the Digital Society: Social, Ethical and Cognitive Issues* (pp189-196). Boston: Kluwer Academic Publishers

# REFERENCES

- Ainscow, M** (2000). Reaching out to all learners: some opportunities and challenges. In H Daniels (ed), *Special Education Re-formed: Beyond Rhetoric* (pp101-122). London: Falmer Press
- Armstrong, D** (2003). *Experiences of Special Education: Re-evaluating Policy and Practice Through Life Stories*. London: RoutledgeFalmer
- Atkinson, D, Jackson, M and Walmsley, J** (eds) (1997). *Forgotten Lives: Exploring the History of Learning Disability*. Kidderminster: BILD
- Banes, D and Walter, R** (1997). The internet: a new frontier for pupils with severe learning difficulties? *British Journal of Special Education*, 24(1), 27-30
- Banes, D and Walter, R** (2000). *Internet for All*. London: David Fulton Publishers
- Becker, HJ** (1992a). Computer-based Integrated Learning Systems in the elementary and middle grades: a critical review and synthesis of evaluation reports. *Journal of Educational Computing Research*, 8(1), 1-41
- Becker, HJ** (1992b). A model for improving the performance of learning systems. *Educational Technology* (September 1992), 6-15
- Becta** (2003). *What the Research Says About ICT Supporting Special Educational Needs (SEN) and Inclusion*. Coventry: Becta
- Billington, T** (2000). *Separating, Losing and Excluding Children: Narratives of Difference*. London: RoutledgeFalmer
- Blamires, M** (ed) (1999). *Enabling Technology for Inclusion*. London: Paul Chapman Publishing
- Brigham, L, Atkinson, D, Jackson, M, Rolph, S and Walmsley, J** (eds) (2000). *Crossing Boundaries: Change and Continuity in the History of Learning Disability*. Kidderminster: BILD
- Brodin, J and Lindstrand, P** (2004). Are computers the solution to support development in children in need of special support? *Technology and Disability*, 16(3), 137-145
- Brown, D** (1993). Microcomputer software: virtual reality, virtually unlimited. *British Journal of Special Education*, 20(1), 12
- Carr, J, McGuinness, S, Oatey, J and Holder, A** (1992). Individual programmes using IT. *British Journal of Special Education*, 19(1), 35-38
- Chappell, M** (2003). Weaving a tale. In M Nind, J Rix, K Sheehy and K Simmons (eds), *Inclusive Education: Diverse Perspectives* (pp. 23-31). London: David Fulton Publishers
- Cigman, R** (ed) (2007). *Included or Excluded? The Challenge of the Mainstream for Some SEN Children*. Abingdon: Routledge
- Cole, J and Swinth, Y** (2004). Comparison of the touchfree switch to a physical switch, children's abilities and preferences: a pilot study. *Journal of Special Education Technology*, 19(2)
- Cowne, E** (2003). *The SENCO Handbook: Working within a Whole-School Approach* (4th ed). London: David Fulton Publishers
- Cromby, J, Standen, P and Brown, D** (1996). The potentials of virtual environments in the education and training of people with learning disabilities. *Journal of Intellectual Disability Research*, 40(6), 489-501

- Crook, C** (1994). *Computers and the Collaborative Experience of Learning*. London: Routledge
- Daniels, H** (ed) (2000). *Special Education Re-formed: Beyond Rhetoric?* London: Falmer Press
- DES** (1978). *Special Educational Needs: Report of the Committee of Enquiry into the Education of Handicapped Children and Young People*. London: HMSO
- Detheridge, M and Detheridge, T** (1997). *Literacy Through Symbols: Improving Access for Children and Adults*. London: David Fulton Publishers
- Detheridge, M and Detheridge, T** (2002). *Literacy Through Symbols: Improving Access for Children and Adults* (2nd ed). London: David Fulton Publishers
- Detheridge, T** (1997). Bridging the communication gap (for pupils with profound and multiple learning difficulties). *British Journal of Special Education*, 24(1), 21-26
- Detheridge, T** (ed) (1994). *Integrated Learning Systems: A Report of the Pilot Evaluation of ILS in the UK*. Coventry: NCET
- DFE** (1994). *Code of Practice on the Identification and Assessment of Special Educational Needs*. London: DES
- DfEE** (2000). *SEN Code of Practice on the Identification and Assessment of Pupils with Special Educational Needs*. London: DfEE
- DfES** (2002). *Survey of Information and Communications Technology in Schools 2002*. London: DfES
- DfES** (2004). *Removing Barriers to Achievement: The Government's Strategy for SEN*. London
- Farrell, M** (2004). *Inclusion at the Crossroads: Special Education - Concepts and Values*. London: David Fulton Publishers
- Fasting, R and Lyster, S-AH** (2005). The effects of computer technology in assisting the development of literacy in young struggling readers and spellers. *European Journal of Special Needs Education*, 20(1), 21-40
- Florian, L and Hegarty, J** (eds) (2004). *ICT and Special Educational Needs: A Tool for Inclusion*. Maidenhead: Open University Press
- Gewirtz, S** (1998). Conceptualizing social justice in education: mapping the territory. *Journal of Education Policy*, 13(4), 469-484
- Gewirtz, S** (2006). Towards a contextualised analysis of social justice in education. *Educational Philosophy and Theory*, 38(1), 69-81
- Goodley, D** (2003). Against a politics of victimisation: disability culture and self-advocates with learning difficulties. In S Riddell and N Watson (eds), *Disability, Culture and Identity* (pp105-130). Harlow: Pearson Education
- Great Britain** (1886). *Classification of Defectives under the Mental Deficiency, Lunacy, Idiots and Education Acts*. London
- Guo, B, Bricout, J and Huang, J** (2004). A common open space or a digital divide? A social model perspective on the online disability community in China. *Disability & Society*, 20(1), 49-66
- Harrysson, B, A Svensk and Johansson, G** (2005). ACCeL system: a new way of controlling computers using pen and paper: some user experiences. *Technology and Disability*, 17(1), 33-36
- Hasselbring, T** (2001). A possible future of special education technology. *Journal of Special Education Technology*, 16(4)

# REFERENCES

- Hawkrigde, D and Vincent, T** (1992). *Learning Difficulties and Computers: Access to the Curriculum*. London: Jessica Kingsley Publishers
- Hedley, I** (2004). Integrated learning systems: effects on learning and self-esteem. In L Florian and J Hegarty (eds), *ICT and Special Educational Needs: A Tool for Inclusion* (pp64-79). Maidenhead: Open University Press
- Herrera, G, Jordan, R and Vera, L** (2006). Abstract concept and imagination teaching through Virtual Reality in people with Autism Spectrum Disorders. *Technology and Disability*, 18, 173-180
- Hick, P, Ainscow, M, Dyson, A, Kalambouka, A, Izzidien, S, Francis, A et al** (2005). *Inclusive Learning with ICT*. Coventry: University of Manchester
- Higgins, E and Raskind, M** (2005). The compensatory effectiveness of the Quicktionary Reading Pen II on the reading comprehension of students with learning disabilities. *Journal of Special Education Technology*, 20(1), 31-40
- Howitt, C and Mattes, J** (2002). The British Museum COMPASS website and learners with special needs. In C Abbott (ed), *Special Educational Needs and the Internet: Issues for the Inclusive Classroom* (pp174). London: RoutledgeFalmer
- Jeffer, T, Behrmann, M and Bannan-Ritland, B** (2006). Assistive Technology and literacy learning: reflections of parents and children. *Journal of Special Education Technology*, 21(1), 38-44
- Lancioni, G, O'Reilly, M, Singh, N, Oliva, D, Piazzolla, G, Pirani, P et al** (2002). Evaluating the use of multiple microswitches and responses for children with multiple disabilities. *Journal of Intellectual Disability Research*, 46(1), 346-351
- Lee, D, McGee, A and Ungar, S** (2001). Using multimedia to teach personal safety to children with severe learning difficulties. *British Journal of Special Education*, 28(2), 65-70
- Lewis, A** (1999). Integrated Learning Systems and pupils with low attainments in reading. *British Journal of Special Education*, 26(3), 153-157
- Lindstrand, P** (2002). ICT (Information and Communication Technology): A natural part of life for children with disabilities? *Technology and Disability*, 14(2), 75-83
- Lindstrom, J-I** (2007). Safe navigation with wireless technology. In P Roe (ed), *Towards an Inclusive Future* (pp9-23). Brussels: COST
- MacKay, G** (2002). The disappearance of disability? Thoughts on a changing culture. *British Journal of Special Education*, 29(4), 159-163
- Maddux, CD and Willis, JW** (1992). Integrated Learning Systems and their alternatives: problems and cautions. *Educational Technology* (September 1992), 51-57
- McKeown, S** (1992). Microcomputer software programs for writing and spelling. *British Journal of Special Education*, 19(3), 100
- McKeown, S** (2000). *Unlocking Potential: How ICT Can Support Children with Special Educational Needs*. Birmingham: The Questions Publishing Company Ltd
- Mechling, L, Gast, D and Langone, J** (2002). Computer-based video instruction to teach persons with moderate

intellectual disabilities to read grocery aisle signs and locate items. *Journal of Special Education*, 35(4), 224-240

**Mirenda, P, Wilk, D and Carson, P** (2000). A retrospective analysis of technology use patterns of students with autism over a five year period. *Journal of Special Education Technology*, 15(3)

**Moss, G, Jewitt, C, Levacic, R, Armstrong, V, Cardini, A and Castle, F** (2007). *The Interactive Whiteboards, Pedagogy and Pupil Performance Evaluation*. London: DfES

**NCET** (1993). *Seen IT in the USA*. Coventry: NCET

**NCET** (1994a). *Seen IT in Australia*. Coventry: NCET

**NCET** (1994b). *Seen IT in the UK*. Coventry: NCET

**Nind, M, Rix, J, Sheehy, K and Simmons, K** (eds) (2003). *Inclusive Education: Diverse Perspectives*. London: David Fulton Publishers

**Nind, M, Sheehy, K and Simmons, K** (eds) (2003). *Inclusive Education: Learners and Learning Contexts*. London: David Fulton Publishers

**Paveley, S** (2002). Inclusion and the web: strategies for improving access. In C Abbott (ed), *SEN and the Internet: Issues for the Inclusive Classroom* (pp44-52). London: RoutledgeFalmer

**Payne, T and Turner, E** (1999). *Dyslexia: A Parents' and Teachers' Guide*. Clevedon: Multilingual Matters

**Phelan, A** (2002). Inclusion through ICT: the wider view. In C Abbott (ed), *SEN and the Internet: Issues for the Inclusive Classroom* (pp146-163). London: RoutledgeFalmer

**Riddell, S and Watson, N** (eds) (2003). *Disability, Culture and Identity*. Harlow: Pearson Prentice Hall

**Rocon, E, Miranda, J and Pons, J** (2006). TechFilter: filtering undesired tremorous movements from PC mouse cursor. *Technology and Disability*, 18(1), 3-8

**Roe, P** (ed) (2007). *Towards an Inclusive Future*. Brussels: COST

**Rogers, C** (2007). Experiencing an 'inclusive' education: parents and their children with 'special educational needs'. *British Journal of Sociology in Education*, 28(1), 55-68

**Rose, R and Grosvenor, I** (2001). *Doing Research in Special Education: Ideas into practice*. London: David Fulton Publishers

**Roston, A** (1992). Microcomputer software: finding a voice on disk. *British Journal of Special Education*, 19(4), 136

**Ryan, T** (2006). The technologically dependent/medically fragile at risk student. *International Journal of Special Education*, 21(3)

**Seymour, W** (2005). ICTs and disability: Exploring the human dimensions of technological engagement. *Technology and Disability*, 17(4), 195-204

**Seymour, W and Lupton, D** (2004). Holding the line online: exploring wired relationships for people with disabilities. *Disability & Society*, 19(4), June 2004

**Shakespeare, T** (1994). Cultural representation of disabled people: dustbins for disavowal. *Disability, Handicap and Society*, 9(3), 283-301

**Singleton, C** (ed) (1994). *Computers and Dyslexia: Educational Applications of New Technology*. Hull: Dyslexia Computer Resource Centre

# REFERENCES

- Snyder, I** (ed) (2002). *Silicon Literacies: Education, Communication and the New Technologies*. London: Routledge
- Soto, D** (1997). *Diego's Story*. London: Vermilion
- Standen, P and Brown, D** (2004). Using virtual environments with pupils with learning difficulties. In L Florian and J Hegarty (eds), *ICT and Special Educational Needs: A Tool for Inclusion* (pp96-108). Maidenhead: Open University Press
- Stephens, J** (ed) (1985). *Devtray Teaching Documents*. London: ILEA
- Stevens, C and Waller, T** (2002). Supporting SEN teachers: policy and management issues. In C Abbott (ed), *SEN and the Internet: Issues for the Inclusive Classroom* (pp121-134). London: RoutledgeFalmer
- Thomas, G and Vaughan, M** (eds) (2004). *Inclusive Education: Readings and Reflections*. Maidenhead: Open University Press
- Tilstone, C and Layton, L** (2004). *Child Development and Teaching Pupils with Special Educational Needs*. London: RoutledgeFalmer
- Tinker, R** (2001). Future technologies for special learners. *Journal of Special Education Technology*, 16(4)
- Twyman, T and Tindal, G** (2006). Using a computer-adapted, conceptually based history text to increase comprehension and problem-solving skills of students with disabilities. *Journal of Special Education Technology*, 21(2), 5-16
- Underwood, J** (ed) (1994). *Integrated Learning Systems in UK Schools*. Coventry: NCET
- UNESCO** (1994). *The Salamanca Statement and Framework for Action on Special Needs Education*
- Ware, D** (2002). Spike the bear and an on-line special school. In C Abbott (ed), *SEN and the Internet: Issues for the Inclusive Classroom* (pp65-72). London: RoutledgeFalmer
- Warnock, M** (2005). *Special Educational Needs: A New Look*. London: Philosophy of Education Society of Great Britain
- Wenger, E** (2000). *Communities of Practice*. Cambridge: Cambridge University Press
- Westwood, P** (2003). *Commonsense Methods for Children with Special Educational Needs*. London: RoutledgeFalmer
- White, M-A** (1992). Are ILSs good education? *Educational Technology* (September 1992), 49-50
- Wilson, J** (2000). 'Learning Difficulties', 'Disability' and 'Special Needs': some problems of partisan conceptualisation. *Disability & Society*, 15(5), 817-824
- Woerden, K v** (2006). Mainstream developments in ICT: why are they important for Assistive Technology? *Technology and Disability*, 18(1), 15-18
- Wright, J, Newton, C, Clarke, M, Donlan, C, Lister, C and Cherguit, J** (2006). Communication aids in the classroom: the views of education staff and speech and language therapists involved with the Communication Aids Project. *British Journal of Special Education*, 33(1), 25-32
- Zorfass, J and Rivero, H** (2005). Collaboration is key: how a community of practice promotes technology integration. *Journal of Special Education Technology*, 20(3), 52-67

## About the Author

Chris Abbott is a Reader in e-Inclusion in the Department of Education and Professional Studies at King's College, London

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### Futurelab

1 Canons Road  
Harbourside  
Bristol BS1 5UH  
United Kingdom

tel: +44 (0)117 915 8200

fax: +44 (0)117 915 8201

e-mail: [info@futurelab.org.uk](mailto:info@futurelab.org.uk)

blog: [flux.futurelab.org.uk](http://flux.futurelab.org.uk)

[www.futurelab.org.uk](http://www.futurelab.org.uk)

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