

# Exploring the challenges of developing digital literacy in the context of special educational needs communities.

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## Abstract

This paper examines the impact of 'digital literacy' in the context of people with moderate to severe learning difficulties. The authors are part of a research consortium developing 'Project @PPLe: Accessibility and Participation in the World Wide Web for People with Learning Disabilities', funded by the Economic and Social Research Council's (ESRC). Project @PPLe aims to explore how people with learning disabilities can access and participate in, and be empowered by, the range of opportunities presented by the digital environment. To meet this aim a multimedia Learning Environment (LE), providing learning resources and tools for self-advocacy, is being developed and tested with young people with learning difficulties, teachers and support-staff. The LE aims to provide routes to learning materials and accessible content for learners matched to individual needs and preferences by a sophisticated content management system underpinned by a range of accessibility, cognitive and pedagogical taxonomies. Although carers, teachers and other supporters are often required to aid the learners in both their online and other tasks, the LE is being developed to facilitate independent use by even those with quite pronounced learning difficulties. In order to develop this system, a usability study was undertaken, partly to inform the software developers with regard to the interface and structure of the particular LE being created, partly to develop a taxonomy of user behaviour to inform this, and also partly to generalise from the findings to inform the wider aim of providing the authoritative guidelines for e-learning and information literacy in the context of special educational needs. This paper explores how a methodology for examining usability was developed, and in particular, the challenges raised by the provision of independent learning for young people with cognitive disabilities.

## Keywords:

learning disabilities, learning objects, special educational needs, digital and visual literacies, information literacy and empowerment, self-advocacy.

## Introduction

This paper examines the concept of digital literacy, an aspect of the wider information literacy, in the context of people with moderate to severe learning difficulties. The authors are part of a research consortium developing 'Project @PPLe: Accessibility and Participation in the World Wide Web for People with Learning Disabilities'<sup>1</sup>. The project aims to explore how people with learning disabilities can access, participate in, and be empowered by computers and the digital environment generally. At the heart of the system is a multimedia Learning Environment (LE), providing learning resources and facilities for users to create and upload information. The paper begins with an outline of various literacies that have appeared in the literature, shows how learners with Special Educational Needs (SEN) can be regarded as being information-literate in their own terms, and lists current UK National Curriculum SEN competencies which reflect information literacy abilities. The LE is then described in detail, showing how its rationality and functionality relate to concepts derived from information literacy, and arguing that by using such a system, learners are exhibiting a degree of independent learning which is the ultimate aim of information literacy.

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<sup>1</sup> The project began in January 2003, and is due to end on 31 December 2005.

## Information, computer and visual literacies

The terms information literacy, digital literacy and computer literacy, whilst being defined in a number of different ways, and applied to various situations and competencies<sup>2</sup>, generally refer to a set of what may be termed higher-order skills. For example, in their review of the concepts inherent in information literacy, Webber and Johnston (2000) state that most definitions include the following elements:

- effective information seeking;
- informed choice of information sources;
- information evaluation and selection;
- awareness of issues to do with bias and reliability of information; and
- effectiveness in transmitting information to others.

Clearly, the ability to evaluate information, make 'informed choices', and understand concepts such as bias and reliability, are reasonably sophisticated. It is no surprise that much of the research literature on information literacy has been concerned with higher education students (Lazonder, 2000; Isokpehi et al, 2000), other academic settings (Breivik & Senn, 1998) or the professional workplace (Shorten et al, 2001; Bruce, 1999). Johnston and Webber (1999), and Andretta (2005a) maintain that information literacy may be developed as an academic discipline in its own right, and, indeed, she describes examples of university-level information literacy courses in her guide to the subject (*ibid.*).

An important aspect of information literacy is that of independent learning. Again, this is discussed generally in terms of higher-level skills. From her review of investigations into information literacy, Hadengue (2005: 36) concludes that:

- information literacy is a competency required right from the first year of academic study, and is particularly important for independent essay and thesis writing; and
- information literacy is also required for subsequent professional activity, as part of lifelong learning.

The Australian and New Zealand Institute for Information Literacy (ANZIIL, Bundy, 2004) offers a diagrammatic representation of the relationship between 'information literacy', 'independent learning' and 'lifelong learning'. Information literacy is placed within the field of independent learning which, in turn, is a part of lifelong learning. Similarly, the American Association of School Librarians and Association for Educational Communications and Technology emphasise independent learning in their Information Literacy Standards for Student Learning (AASL/AECT, 1998), which provides a framework and broad guidelines for describing the information-literate student. The standards consist of three categories, nine standards, and twenty-nine indicators. Those related to independent learning refer to information literacy openly, standard Four, for example, states that "The student who is an independent learner is information literate and pursues information related to personal interests" (AASL/AECT, 1998: 5).

Information literacy as the foundation of independent learning is also promoted by the American Library Association's claim that: "information literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them" (ALAPCIL, 1989).<sup>3</sup>

Given the propensity to regard 'information literacy' as requiring somewhat advanced skills it may be considered inappropriate to describe people with cognitive disabilities as being information literate. In fact, as Andretta points out 'some information practitioners are reluctant to use the term literacy because of the perceived association with the issue of illiteracy,' (2005a: 19). She also notes that the phrase information skills, rather than information literacy, is also found in the literature, for example, the Society of College National and University

<sup>2</sup> see Bawden, 2001 for a review.

<sup>3</sup> Quoted in Andretta, 2005b: 182.

Libraries (SCONUL), initially used this term to describe its position on the subject<sup>4</sup>. Skills, in place of literacies was also used by the Joint Information Systems Committee (JISC) when tendering for a project looking at training in UK further and higher education, *The Big Blue* (2001). It could be argued that by not using the word 'literacy' one might be downplaying the skills that those of limited academic ability are nevertheless able to show, often in a digital environment. McGarry (1993) points out that literacy is a relative concept: "to be literate in the Honduras is not the same as to be literate in Hampstead, London NW3. Literacy can denote a minimal print-decoding skill; it may denote a critical awareness of the cultural assumptions, the ethical norms and the aesthetic value of the printed word".<sup>5</sup> It is argued later in this paper that even those of very limited literacy ability may merit the accolade of having a degree of digital or computer literacy, if not textual or alphabetical literacy, and thus may be defined as information literate.

In fact, many of the subjects of the research project reported in this paper were functionally illiterate. How, then, can they be viewed as having or developing information literacy or even information skills? The answer is in the relationship between computer/digital or Information and communications technology (ICT) literacy and the wider concept of information literacy. As Bawden's (2001) review of the area shows, the former is generally regarded as a subset of, and therefore part of, the latter. He regards the most common definitions as illustrating pragmatic and skills-based approaches, and cites the UK Royal Society of Arts computer literacy training scheme RSA (1993), which consists of "An introduction to the skills required to operate a variety of computer applications packages, such as word processing, databases, spreadsheets, etc., together with some general IT skills" (ibid: 225-226).

A wider definition of computer literacy is that by Shapiro and Hughes (1996: 34), who describe a curriculum for computer literacy based upon seven dimensions. These are:

- Tool literacy, or the ability to understand and use the [...] tools of current information technology, including software, hardware and multimedia, that are relevant to education and the areas of work and professional life that the individual expects to inhabit.
- Resource literacy, or the ability to understand the form, format, location and access methods of information resources,
- Social-structural literacy, or knowing that and how information is socially situated and produced.
- Research literacy, or the ability to understand and use the IT-based tools relevant to the work of today's researcher and scholar [...]
- Publishing literacy, or the ability to format and publish research and ideas electronically, in textual and multimedia forms (including via World Wide Web [...] and CD-ROMs).
- Emerging technology literacy, or the ability to [...] adapt to, understand, evaluate and make use of the continually emerging innovations in information technology.
- Critical literacy, or the ability to evaluate critically the intellectual, human and social strengths and weaknesses, potentials and limits, benefits and costs of information technologies.

Clearly, many of the aspects of computer literacy described above, as with the general definitions of information literacy, require a high level of cognitive competence. These include sub-literacies, as they may be called, itemised by Shapiro and Hughes (1996). However, a large body of research and professional literature (see: Abbott & Cribb, 2001; Baner & Walter, 1997; Florian, 2004; Larcher, 2000; Standen & Brown, 2004) shows that people with both physical and cognitive disabilities, defined here as Special Education Needs, or SEN, may be adept at using computers or other information technology, often with the aid of assistive devices, and that, therefore, they are able to claim a degree of information literacy. Project @PPLe, to which this paper now turns, describes a research project which aims to empower people with learning disabilities by the utilisation of ICT.

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<sup>4</sup> SCONUL has, however, reverted again to using the term 'literacy' in its model 'Seven Pillars of information literacy' (see SCONUL, 2005).

<sup>5</sup> Quoted in Bawden, 2001: 221

## Project @PPLe and the SEN community

The World Health Organisation defines learning disabilities as “a state of arrested or incomplete development of mind” (WHO, 1992: 7). Somebody with a learning disability is said also to have significant impairment of intellectual and adaptive/social functioning. The Warnock Committee (1978) suggested that the term learning difficulties cover specific problems with learning in children that might arise as a result of a number of different things, e.g. medical problems, emotional problems, language impairments to name a few. Importantly, the term learning difficulties, which replaced the earlier term educationally sub-normal, does not focus on an innate disability but on a difficulty in terms of learning. As outlined by the UK learning disability charity Mencap (2005), a learning disability “affects the way someone learns, communicates or does some everyday things”. According to Mencap (ibid), 1.5 million people in the UK have a learning disability. In addition there are many different types of learning disability, described as mild, moderate or severe. They can also be described as ‘profound’ and ‘multiple’. Some people with a learning disability also have a physical disability, often as a result of their cognitive limitations. However, neither a physical nor a cognitive disability stops someone from learning and achieving, if they get the right support.

People with learning disabilities, as everyone else, have information and communication needs. The former, clearly, will be at a more personal level than those of their carers and supporters. However, the person with learning difficulties may well want to know, just as others would, with whom his or her favourite football team is playing on Saturday. Similarly, people are only able to communicate if they understand the information communicated to them, to which they are required to respond. However, many individuals have difficulties in accessing and processing information because of the way in which it is presented, for example there is a heavy reliance on conventional forms of communication, such as text and spoken word, even in electronic media such as the Web. Furthermore, people with learning difficulties are vulnerable to disempowerment, as they are more prone to acquiesce to the suggestions of others (Grove et al, 2000).

Project @PPLe: Accessibility and Participation in the World Wide Web for People with Learning Disabilities is a cross-disciplinary initiative, funded by the Economic and Social Research Council’s (ESRC) and the PACCIT programme (People at the Centre of Communications and Information Technology) this project brings together academic researchers (from the fields of Communication Science, Informatics and Cultural/Technology Studies); small and corporate business partners, including Macromedia, and the learning disability charity Mencap. Its aim is to help people with learning disabilities exploit information and communication technologies in order to facilitate information acquisition and creation, communication and self-advocacy, and to undertake appropriate learning tasks, games and other activities. The project is thus predicated on the belief that ICT can facilitate both communication and information acquisition/use by this particular group, despite the cognitive difficulties its members manifest.

The learners with whom Project @PPLe is working have moderate to severe learning difficulties, which generally manifests themselves in:

- Short attention span
- Limited or no functional language
- Limited motor skills

However, they also have:

- Good receptive language (i.e. they are able to understand instructions)
- Some basic experience of using computers
- The ability to perform basic tasks (colouring/gluing; basic food preparation etc.)

Some of the participants are on the autistic spectrum, or have Downs syndrome.

With regard to the learning part of the system, pre-existing material from a project undertaken by the University of East London and Mencap, Trans-active, designed for learners with similar

cognitive profiles as outlined above, is being developed, edited and re-purposed to form a repository of content modelled for consumption in the required combinations. The system is based around a repository of learning objects compiled by commercial partner Xtensis, classified using National Skills Profile, National Curriculum/P-Scale and ASDAN taxonomies, described later in this paper. These resources are delivered to a teachers' interface on the LE. Profiles of users based on these taxonomies are created by teachers, and supplemented by user preferences captured via a rating system, described below, activated after each activity. In these ways, the system builds a profile of individual learners' requirements, preferences and abilities, and aims to provide routes to appropriate learning materials and accessible content.

In addition to its pedagogical function, LE is concerned with promoting self-advocacy (beyond the degree to which that might be enabled in the learning aspect), such as being aware of life options and preferences, and being able to express them. For those with severe and profound learning disabilities, making major life decisions will inevitably be a supported exercise undertaken by carers, families or teachers advocating on their behalf in dealings with organisations and agencies involved in guiding the learner in the progression to adulthood and, possibly, a job, further training or education. However, the process is flawed where the person with the learning disability is not given the opportunity to voice his or her own views effectively. The project aims to enable the learners to be the *producers* of information about themselves, for communication and self-advocacy. To this end, cameras, video and multimedia authoring software are being used for the production of personal records which make up a personal electronic Passport. This exercise enhances the learners' publishing literacy skills.

The system designed to transmit the information is the multimedia Passport software with which the users navigate around material pointing to different images and reinforcing their intended meanings to the best of their ability. The consumer of the information-set thus created is the carer, teacher, family or professional concerned with supporting the Passport's author. It is worth noting that the development of the Passport application into other fields may make the information creators themselves consumers of the very information they produce. An example of this might be sufferers of Alzheimer's disease, who could create a personal Passport specifically to help maintain their own self-awareness and memory. A second point is that the process of information creation is integrated with user needs research<sup>6</sup>, in that the Passport must both reflect the needs of the learner and be of use to the support community, which needs information to be able to react to the self-advocacy that the Passport aims to facilitate.

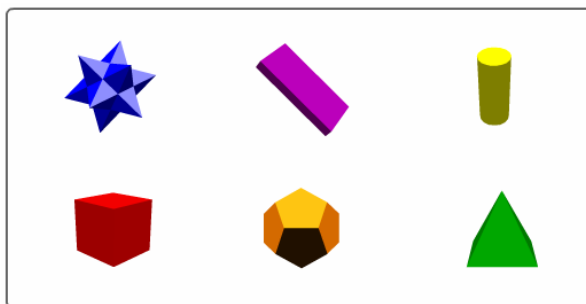
The system is being developed so that the learners may engage in learning, communicating and participating generally in the educational environment with as little help as possible from teachers or teaching assistants. Thus, in addition to the benefits of having a certain ownership of their learning and a degree of autonomy, the students also acquire some of the elements of information literacy. This is illustrated in the following section.

#### *The system*

The system is web-based and accessed by a teacher. Once the site is accessed a learner ID number is input, beyond which, the learner takes control. The log-in page of the learner interface - appearing once the teacher has accessed the system, presents the first instance of learner independence. A graphical log-in has been developed to avoid the use of text to enable this. Two sets of six images are presented to users (see Figure 1).

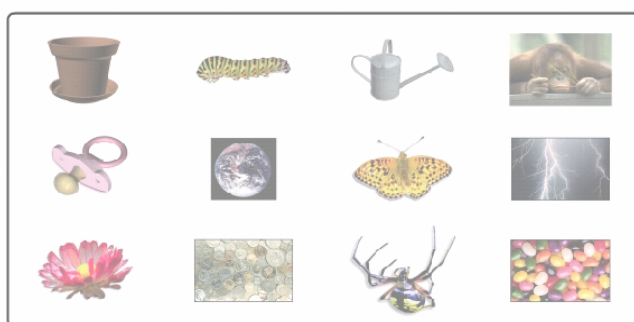
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<sup>6</sup> This is reported elsewhere, see Williams, in press.



**Figure1: LE log-in screen one**

The learners choose one image, which when clicked, leads to the second set (Figure 2). The two images become their log-in password, and have to be chosen every time the system is accessed. Having the ability to do this is not only designed to give the students a certain power, and the accompanying self-esteem (whether this is true will be tested by the project team once the system is rolled-out), but will also go towards the development of visual literacy.

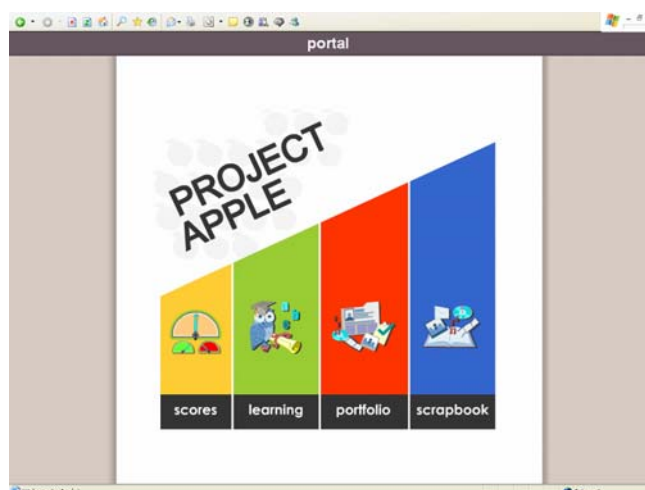


**Figure 2: LE log-in screen two**

Once in the system, users are presented with a Home page (Figure 3), which is a portal which will, when the system is fully developed, give access to four main functions:

- Scrapbook: an area for storing images and other resources for later use
- Learning: a list of the learner's current or possible assignments (determined, as mentioned above, by a profile of their cognitive and physical needs and abilities, preferences, work undertaken and curricular area being studied),
- Portfolio: a record of student work and activities, and other evidence of competencies achieved (such as digital photographs of a particular skill being demonstrated)
- Scores: a link to the learner's personal Targets and Progress page.

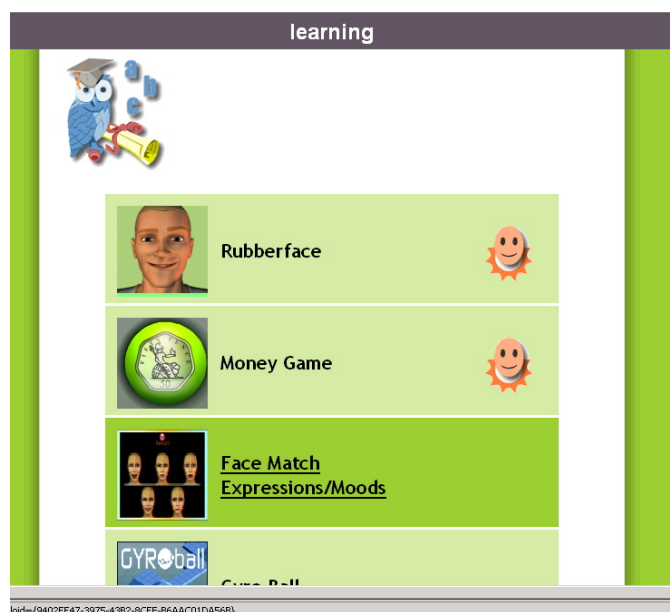
Once logged-in, all other pages are presented full-screen, with no visible browser bars.



**Figure 3: Learner 'Home page'**

If the user elects the 'Learning' option, s/he is presented with a list of activities to undertake. In keeping with the aim of promoting an individualised learner-centred environment, users can choose for themselves which of the activities presented (see Figure 4) they wish to undertake. Choosing learning objects independently is an aspect of information literacy highlighted by Andretta (2005a), for example, on courses run to foster independent learning. For this system, users need to learn the scroll facility, relate the picture introducing each activity with some notion of what the activity entails, and access the activity by activating a hyperlink.

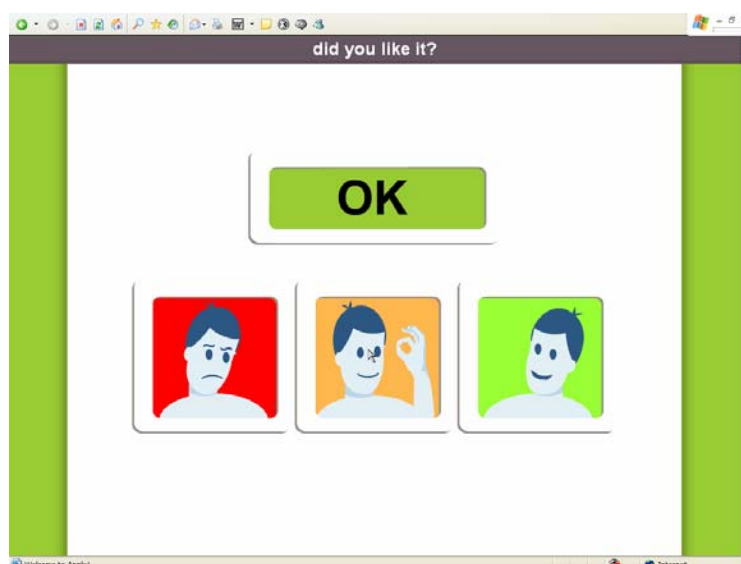
The activities shown in Figure 4 are Rubberface, in which the user can manipulate the image of a face by use of a cursor; Money game, in which users are required to add coins to until a given amount is reached, by clicking on the appropriate images associated with the required sum and Face match, in which users respond to an audio cue (saying happy, sad etc.) by choosing the face which matches the expression given.



**Figure 4: LE Activities page**

Another aspect of information literacy is that of evaluating material. Clearly, for a learner with cognitive difficulties the articulation of such an evaluation, if not the evaluation itself, will be somewhat limited. The LE is incorporating a feedback mechanism through which learners can 'rate' activities. As can be seen in Figure 5, this consists of three faces, representing negative,

neutral and positive views of the activity. The upper central box displays Like, Dislike and OK depending on which image the mouse is over. Most students will rely on their visual literacy skills in interpreting the pictures, as the majority would not be able to read. Selecting the 'Like' or Dislike image leads to further options, the former showing being Happy or Excited, denoted by appropriate facial images; and the latter Couldn't start, Too boring and Too hard which are also illustrated visually. Future trials may indicate that a system incorporating only a positive and negative image may be more appropriate. Indeed, it will be possible for the system to incorporate more than one rating scale as, once a user is logged in, an appropriate scale could be loaded. Those who are less cognitively able may be presented with a simple binary choice, while those more capable could be presented with the three level choice as described above. The rating goes into a database and is used in the student profile to determine the learning activities which are presented to the learner for any given session.



**Figure 5: LE rating system**

The Passport facility, which enables users to upload information about themselves, requires the learner to take digital photographs and create scans of objects depicting such information as Things I can do for myself; Things I enjoy doing; My favourite objects, etc. These activities are designed to enable a degree of self-advocacy, so that the learners themselves can describe, or show, their preferences, and needs.

### **Information literacy and Special Educational Needs (SEN)**

There are three main arguments for suggesting that people with SEN may be considered to have a measurable level of information literacy. This is because many:

- are able to use ICT, and thus exhibit computer or digital literacy
- demonstrate visual literacy in their use of ICT
- can learn independently, if offered appropriate resources.

Taking the first point, many SEN students are able to use a variety of computer hardware and software, albeit often requiring specially adapted interfaces and assistive devices. Indeed, as Rahamin (2004) states, ICT has been used to support learners with special educational needs for many years, Project @PPLE is just one recent manifestation of this trend. He gives the example of electronic typewriters being provided in the 1970s to people who were unable to use a pencil correctly because of physical disabilities. Rahamin (2004) quotes from Blamires' definition of ICT as "enabling technology" to describe this phenomenon (Blamires, 1999: 6). Those using this 'enabling technology' demonstrate an aspect of computer literacy. That they may not be sophisticated users is not an issue, computer literacy is said to be acquired if a person has reached the level relevant to the educational or professional life that they expect to inhabit. Similarly, fieldwork observation and interviews undertaken by the authors in schools for people with learning difficulties also provide evidence that even those

with quite profound learning difficulties are able to use various applications, unaided in some cases, prior to the introduction of the Project @PPLE system into their school experience.

These include:

- Searching the Internet for information or images of interest, such as pop singers or famous athletes or other entertainment personalities. Harrysson et al (2004), for example, observed a small sample of SEN users as they navigated between different web pages using a standard web browser. Subjects, who ranged from 15 to 44 years, were set a series of web navigation tasks, on a selection of chosen web sites. Results suggested that the group were adept at navigation. They used the forward/back buttons without difficulty, and recognised, and used, hyperlinks, all clear examples of information literacy competences. However, where text-input was required, the users had difficulty, a problem also noted in observations by the current authors in their work, and where adult intervention was needed for the majority of students.
- Using PowerPoint to make presentations. These were sometimes text-free, and included images captured from the Internet or digital camera, highlighting a favourite topic. Observations showed that many students were able to use the right context menu to copy an image, and had no difficulty in pasting it onto a PowerPoint slide. This might have been true for more students had better accessibility devices been available, for example the right-hand menu button was not easily accessible by some students.
- Writing exercises in Word or other application, for example plans of visits, for those who were capable of writing. This was considered advantageous to staff, echoing the observation by Rahamin (2004) that such applications can facilitate writing, as the student is not hampered by needing to learn to write neatly or even hold a pen.
- Using Publisher to create pages and brochures, mentioned by the staff member who had been on ICT courses, although she confirmed that she had to give a great deal of assistance to learners using this application.
- Using digital cameras. In addition to observed usage of cameras, one interviewee in the current study reported using a camera with a video capability in homework, whereby the students take a camera home, use it to video something they like, bring it back to school, and show it to the class.

In these ways those with special educational needs could be said not only to have a degree of computer or digital literacy, but also of publishing literacy, another aspect of the wider concept of information literacy. It is hoped, clearly, that pilot use of the LE produced will demonstrate further that it is, indeed, possible for those with learning difficulties to demonstrate information literacy competences.

The second argument for describing those with cognitive difficulties as being information-literate can be made when information is considered to be more than just the understanding of the written word. Understanding the meaning of a back arrow button or home icon demonstrate a form of information literacy for which textual literacy is not required. This form of literacy has been recognised in the literature, and is known as visual literacy. An early definition of the concept is provided by Fransecky and Debes (1972: 7), who describe it as “a group of vision competencies a human being can develop ... [enabling] a visually literate person to discriminate and interpret the visual actions, objects, and/or symbols, natural or man-made [...] encountered [in the] environment. Through the creative use of these competencies, [we are] able to communicate with others [and] comprehend and enjoy ... visual communications”. Heinich et al offered the following definition, “Visual literacy is the learned ability to *interpret* visual messages accurately and to *create* such messages” (1982: 62), and thus introduced the idea of creation as well as understanding/interpreting a received existing image. The system being developed is designed in part to enable the creation of visual information by the learners, and thus meets Heinich’s criteria that a visually literate person has the ability to create visual messages. Competence with PowerPoint also, of course, demonstrates this, as will mastery of the games and activities to be accessed through the LE.

Finally, it is possible for people with cognitive difficulties to work independently, given appropriate initial support and suitable learning materials. Clearly, as Florian (2004) states, those with more profound difficulties have fewer opportunities to explore and control their environment and their learning. However, Florian goes on to suggest that “virtual environments can offer opportunities for learning [ ... by] personalis[ing] material using sounds and pictures that are familiar to the learner” (2004: 13). Hawkrigde and Vincent (1992) claim that computers enable pupils to have some control over their own learning, a view echoed by Standen and Brown (2004) who argue that “interactive software encourages active involvement in learning gives the user the experience of control over the learning process.” (2004: 96) The keyword here are personalisation and control. These are both important concepts in independent learning, and the cornerstones of Project @PPLe.

### **The educational context of SEN students**

It is important to consider the educational context within which the young people with special needs operate, and how skills and knowledge learned at a basic cognitive level can be classified as showing information literacy abilities. Much emphasis has recently been placed on formal literacy and numeracy in the UK educational system. The UK government’s National Literacy Strategy Framework for teaching (DfES 2001a, b) sets out the intended range and balance of work in reading and writing in an attempt to ensure that pupils become properly literate. The Framework defines a set of teaching objectives, illustrating how literacy can be planned and taught. The QCA guidance ‘Planning, teaching and assessing the curriculum for pupils with learning difficulties’ (QCA, 2001a) outlines ways in which the English programmes of study can be modified for pupils who are working significantly below age-related expectations. Similarly, the DfES’ publication *Towards the National Curriculum for English* (2002) has produced a hierarchical list of pupil behaviour and activities which helps pupils with special educational needs to acquire a degree of literacy. The list comprises ‘P’ scales (or levels). These are a set of indicators for recording the achievement of pupils with special educational needs who are working towards the first level of the National Curriculum. The scales are designed for pupils who are well below the level of their peers. The P scales (QCA, 2001b) are split into eight different levels with P1 being the lowest and P8 the highest. Subject specific scales start at P4, except for generic skills such as reading and information technology. Examples shown here are extracts from the guidelines produced by the DfES (2002) and include P scales that illustrate an active engagement with the information, one of the main elements of information literacy:

#### **P-level 1**

- Occasionally look at a picture or photograph with interest
- Look with interest at a computer screen while a cause and- effect programme is being used by somebody else
- Coactively operate a switch programmed to speak a repetitive refrain in a story

## P-level 2

- With help, choose a symbol or picture which relates to a person or object, e.g. book, teacher
- Operate a switch programmed to speak a repetitive refrain in a story, immediately after coactive demonstration

## P-level 3

- Recognise own photograph and those of familiar people and objects
- Point to or eye point to own belongings, e.g. coat, bag, or to an object of reference associated with a familiar text.

There are also P levels associated with information technology, in which activities and competencies clearly associated with computer or digital literacy are itemised. Some of these are reproduced here listed as bullet points:

P-level 3, for example covers aspects of digital as well as information literacy.

- Pupils [...] can remember learned responses [...] and may anticipate known events, for example, looking at the monitor screen as they activate a concept keyboard.
- They may respond to options and choices with actions or gestures, for example, operating one switch rather than another to achieve a desired result.

## P-level 4

- Pupils make selections to communicate meanings, *for example, identifying a symbol*
- They know that certain actions produce predictable results, *for example, using a switch to activate a tape recorder.*

## P-level 5

- Pupils use computer programs, *for example, to move a device to manipulate something on screen.*
- They make connections between control devices and information on screen, *for example, pressing a specific graphic on a touch screen.*

## P-level 6

- Pupils [...] use a keyboard or touch screen to select letters and/or images for their own names.
- They show they understand that information can be stored on a computer, *for example, they ask to see a picture saved earlier.*

## P-level 7

- Pupils [...] use ICT to communicate meaning and express ideas in a variety of contexts, *for example, choosing digitised photographs [...] for their personal profiles.*
- They begin to choose equipment and software for a familiar activity, *for example, using a writing-with-symbols programme to send a message.*

## P-level 8

- Pupils use ICT to communicate and present their ideas, *for example, recording sounds on tape and replaying them or taking photographs of their own work.*
- Pupils can load a resource and make a choice from it, *for example, a particular game on a CD, a section of a DVD.*

These scales comprise one of the taxonomies used to personalise content in the LE being developed as the main focus of Project @PPLe. Learners' use of the LE content will be an indicator of their acquisition of information and digital literacies. For example, having the ability to log-in indicates successful acquisition of at least P level 3, which requires recognition of familiar people and objects. It also shows mastery of P level 4 in information technology in knowing that certain actions produce predictable results, and respond(ing) to options and choices. The skills required to undertake game and other activities may be considered to be of a higher order than recognising the log-in shapes, and co-respond to P scales 7, using a computer for a familiar activity, and 8, loading a resource and making a choice from it.

Finally, the undertaking of Passport-creating activities demonstrates competence at P-levels 7, using ICT to communicate meaning and express ideas in a variety of contexts, and 8, using ICT to communicate and present their ideas, and therefore it illustrates competences at certain aspects of computer literacy, identified by Shapiro and Hughes (1996) as publishing literacy. Indeed, this information production demonstrates Heinich et al (1982) visual literacy competence of being able to create visual information. This might be particularly true with regard to the use of digital cameras, scanners and other computer peripherals.

## Conclusion and future work

This paper has attempted to show how it is possible to facilitate, through ICT, an independent and personalised learning environment for people with quite profound cognitive disabilities to enable them to access and use electronic information systems; access learning tasks appropriate to their needs, and evaluate these according to a basic rating system, thus exercising control over their learning. It has argued that by carrying out these activities, the learners exhibit a form of information literacy related both to their use of ICT, or digital literacy, and their understanding of images and icons defined as visual literacy. As mentioned earlier, learners have supported access not only to computers, but also to multimedia equipment with which to record their experience and activities, thus adding to their general 'information' expertise. The real benefits the project aims to provide are those of empowering learners, and in this sense information literacy, through its emphasis on independent learning, fully supports their emancipation. By incorporating the use of a variety of multimedia applications and hardware, the programme aims to facilitate both self-advocacy that often bypasses the use of text, and gives SEN learners a voice and active control over some of the decisions that affect their lives. Being able to communicate preferences, needs, aspirations, abilities etc., even by the relatively crude method of displaying photographic or video evidence of a particular competence, or preferred activity being undertaken, should be crucial in empowering this often marginalised learner group.

The next step in the project is to examine the system in use, in order to identify the most effective method by which a complex set of needs may be met in the interplay between information seeking, creating and consumption mediated by the ICT developed in general, and by the use of the Passport in particular. This aspect of the research is particularly germane to the wider work of the present authors. Their previous research (Huntington et al, 2002, Williams et al. 2003) points towards the need for different levels of information content, in terms of complexity, subject coverage and content angle, which an electronically based hierarchical system would facilitate. In this case, the material will meet a sliding spectrum of both ability and support and thus serve a variety of combinations of users with cognitive disability and supporters with different levels of engagement.

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