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Understanding User Requirements and Expectations of Digital Learning Resources

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Abstract: This paper discusses the need to understand e-learning users, their goals, tasks, and requirements. A research project carried out addressing some of these concerns in the context of basic education in England is presented here. A series of engagement activities were carried out exploring how digital learning resources are actually used in classroom teaching and learning aiming to elucidate user needs and expectations. Results are discussed in detail and some recommendations for future development put forward.

Keywords: Digital learning resources, basic education, user requirements

Introduction

"Know thy user" is the fundamental mantra for Human-Centered Design (HCD) specialists. Understanding e-learning users, their goals, needs and expectations should therefore be the basis on which interactive learning materials, tools and environments are designed. Research addressing learning technologies and e-learning is extensive; current interests range from game-base learning, mobile learning, AI in education and adaptive learning, to collaborative learning and social and virtual environments, to mention but a few topics. It is also noticeable that a high volume of such research is concerned with e-learning in higher education whilst there is relatively little on such needs in Primary or Secondary schools.

The research reported in this paper aimed at understanding learning technology users in basic education schools in England. Comparatively little information is available describing actual usage of Digital Learning Resources (DLR) by teachers and learners in schools. In order to further inform design, and development, research was required exploring users characteristics and context of use to understand, for example, what teachers feel about the suitability of DLR and associated technology available to them, what their understanding of quality is, what aspects enable or block their use of technology; to sum up: what their requirements and expectations are.

1. Research approach

The aim of this research was to understand user needs, expectations and experiences with DLR in Primary and Secondary schools in England. A research team from the Communication and Computing Research Centre (CCRC) at Sheffield Hallam University was thus commissioned to work with teachers and other stakeholders to investigate:

- How DLR are actually used in classroom teaching and learning
- How well teachers feel their requirements for DLR are being met
- What measures and activities could improve the supply, quality and use of DLR in schools

Our approach to tackling this project was firmly grounded on user-centered principles in that user characteristics and their context of use should be understood and used to inform design and development of interactive materials, tools and learning environments.

1.1 *The context of digital technologies in education in England*

It is not just the specific technological context within each school that determines the type of learning interactions that take place and influences the e-learning users' requirements and expectations. Social and organizational aspects are as relevant in HCD and as such understanding the broader landscape in which schools operate was particularly important in shaping the research approach of this study. These aspects might also be relevant for interested readers unfamiliar with the school system in England. According to the national statistics on schools, pupils and their characteristics [5], in the school year 2009-2010 there were 16,971 primary schools and 3,127 secondary schools in England; the total number of maintained schools in basic education was 24,616.

At the administrative level, schools are coordinated by Local Authorities (LA). There are 150 LA in England, and they are responsible for the strategic management of education services [6]. An important role for LA is to support and encourage schools to improve learning with Information and Communication Technologies (ICT), for which different LA have different approaches. In some regions, schools are responsible for the acquisition of DLR out of the school's budget; other LA have adopted regional strategies and have been responsible for the acquisition of specific learning platforms and/or educational software for /some or all schools under their management.

At the strategic level, the main initiative for the future development of ICT in education is "Harnessing Technology" [4], which identifies the main objectives and priorities for the inclusion of digital technologies for teaching and learning.

BECTA is the government agency responsible for helping schools and LA implement the Harnessing Technology strategies.1 BECTA strive to embed effective use of technology in education and to ensure that market developed products and services meet the needs of schools. Its main activities include research, evaluation and independent advice.

Some national strategies that have strongly influenced the current shape of digital technologies in schools include the adoption of Interactive Whiteboards (IWB) around the year 2000, and more recently of Learning Platforms (LP) -i.e. virtual learning environments. According to a recent report [3], 99% of primary school teachers and 84% of secondary school teachers have access to IWB. Similarly, 93% of secondary schools reported they had a learning platform in operations, compared to 67% of primary schools and 56% of special schools.

Additional authorities in the context of digital technologies in basic education are City Learning Centers (CLCs) and regional Grids for Learning (GfL). CLCs were established as part of an excellence program designed to support the educational challenges of the major cities in England [2]. 105 CLCs were set up in urban areas where there was a mixture of social disadvantage and underperformance in schools. CLCs aim at providing enhanced ICT based learning for pupils and teachers, particularly in secondary schools, and to provide access to education to the wider community. In most cases CLCs are based at a building attached to a host school and they serve a network of schools in the area.

1.2 Methodology

Engagement with stakeholders was primarily through workshops, predominantly involving members of the teaching community and some representatives of LA, CLCs and regional Grids for Learning (GfL). The project's fieldwork included 8 workshops, through which 59 participants from 36 schools were engaged in the research. In line with the aims of the project, the main themes identified were:

- Common practice in the use of DLRs
- Current approaches to finding DLRs
- Assessment of fitness for purpose and quality of DLRs

Activities during the workshops were organized around six worksheets addressing each of the themes. Activities aimed at gathering experiences and opinions, and facilitating constructive discussion. Discussions were conducted using semi-structured protocols encouraging participants to share their experiences and to cover the primary objectives, whilst also ensuring that emergent observations were fully recognized.

Data collected through these activities included written information from the participants, collaboratively composed summaries of the discussion tasks and the facilitators' notes. For each theme data was analysed using collaborative discourse analysis techniques, by the research team against the research objectives.

Since participation in the workshops was voluntary, it was important to prevent findings from being potentially skewed due to the self selecting nature of the participants, thus additional strategies were employed, including 13 individual interviews and an online survey gaining 58 responses. These provided additional sources of information used to cross-validate workshop findings.

2. Results

2.1 The school context

Results from the engagement activities emphasized that most teachers are convinced of the value of ICT but they are not interested in becoming ICT experts. They are keen to use what they know and what they think is reliable, but few of them are prepared to spend time experimenting.

Participants suggested that teachers tend to be very inward looking and place much trust in the judgment of their colleagues. It also became apparent that time and inclination are two motivating factors for teachers using DLRs.

Moreover, participants extensively recognized that their learners have spent their lives surrounded by technology and as a result are confident users of ICT. These "digital natives" [7], also known as the "Net generation" [1], represent new challenges for teachers as often they are highly ICT literate - in some cases more so than the teachers.

An additional aspect that emerged was that younger teachers seemed to be more confident using ICT and therefore more enthusiastic embedding DLRs in their practice. This may be related to the fact that some of them are actually digital natives and some others have been taught using ICT. Furthermore, the training these new graduates receive greatly influences their teaching strategies; for example, they make extensive use of software and/or online resources recommended during training.

The Harnessing Technology strategy does appear to be influencing use of DLRs and ICTs on the ground, for example in cases such as: government policies, strategies and initiatives. Examples of these include:

- The introduction of IWB in schools. As expressed by our participants, when this initiative was put forward, schools were not convinced about its potential advantages. Currently, IWB are extensively used and perceptions of their usefulness are quite positive among teachers.
- Changes to the National Curriculum in relation to the ways ICT is delivered in schools.
- Major changes in the school provision, such as the introduction of compulsory modern foreign languages and how these are taught using ICTs.

With the increasing use of DLRs, the technological infrastructure of the school plays a major role. Infrastructure determines to a great extent the kind of resources teachers can or cannot use in class and technology's reliability is a big concern: if the infrastructure does not work, the DLRs will not. The issue of preparing for a class when technology might fail was widely discussed during our workshops, and having a strong back-up plan (a "plan-B"), was considered essential.

2.2 Advantages and disadvantages of DLRs

Most teachers accept the benefits of ICT but are frustrated by its limitations, where the common argument is that DLRs are not designed with teachers and learners in mind. Participants identified four key advantages of DLRs. They offer:

- Enhanced teaching and learning by providing interaction, explaining or demonstrating concepts in a different, innovative way
- Visually appealing to children - colourful, neat graphic content, which can help create interest and engagement
- Some DLRs such as animations and simulations can help explain difficult concepts or experience processes that otherwise would not be possible
- Sharing DLRs represents a mechanism to share good practice

In the same way, some disadvantages of DLRs were discussed, particularly that:

- Content prepared outside school can be blocked, unavailable or may not work in the classroom; e.g. video clips from YouTube
- Finding or creating the right DLR can be time consuming
- Lack of time may make it difficult for teachers to get to know a DLR well
- Resources do not change quickly enough to keep up with curriculum changes
- DLRs may be expensive
- Lack of available titles to suit specific needs, including infant schools, Special Educational Needs (SEN) children, migrant and ethnic minority children, and students in Pupil Referral Units.

2.3 Drivers for using DLRs

According to our participants, the main driver for using DLRs is to enhance learning. DLRs are treated as any other resource: teachers plan their lessons and look for the best resources to meet the needs of their learners. A strong message frequently expressed throughout the engagement workshops was therefore that DLRs are not the answer to everything.

To incorporate DLRs within the teachers' practice, resources have to fit within their individual approach and particular strategies. Thus, an important requirement of DLRs is

flexibility; fitting resources to specific contexts also leads to many teachers being keen to create, adapt and repurpose DLRs (see section 2.5).

DLRs are therefore used where they add value to the teaching and learning process. DLRs are expected to enhance teaching, making learning more interesting and helping to achieve desired learning goals.

Selection of DLRs depends on the specific subject being taught and the extent to which objectives from the National Curriculum are effectively being supported. Moreover, the group age, key stage and ability level determines suitability of existing DLRs.

Personalized learning is quite high on the agenda for teachers. Accordingly, DLRs are chosen or rejected based on how well they can support pupils with different ability levels, learning styles or special needs. Additional considerations include ease of use, attractiveness and whether the resource will help engage children in their own personalized learning.

2.4 Blockers for using DLRs

While most classrooms have IWB, not all of them have individual computers for the learners to use. Using laptops may help, but it requires careful consideration of some practical issues such as moving the laptop trolley around the school, making sure that batteries are fully charged and getting access to the Internet if required.

Compatibility issues also extend to the types of computers co-existing in schools and the need for versions to suit Macs as well as PCs. In addition, older DLRs may not work properly with newer versions of operating systems. In addition, technology is ageing and there is not always provision in the budget to keep the school ICT infrastructure up-to-date.

Not just availability of equipment, but availability of DLRs in school is an issue; which is linked to the school budget and the school priorities.

Laptops and PCs are commonly configured to minimum specs to keep costs down, but most recent DLRs require extensive memory, disk space, etc. In the same way, the availability of different types of IWB around classrooms means that different types of interaction are possible and also that different file formats are required for DLRs. This in turn means that depending on the equipment available in specific rooms, use of DLRs such as video clips may be hindered - e.g. file formats, codecs.

Training and technical support available are also important issues influencing use of DLRs in schools. The general perception among participants was that the acquisition of the necessary skills to successfully use DLRs for teaching and learning is not commonly linked to a strategic school approach. Hence, the view was that it is necessary to invest personal time.

2.5 Creation and Re-purposing DLRs

Creation and re-purposing of DLRs were topics extensively discussed. Some teachers create their own digital resources by capturing assets (e.g. through the use of digital cameras, camcorders, voice recorders,) or developing software content (e.g. interactive games). Many others re-purpose existing DLRs by assembling learning activities, personalizing interactive content, creating slide shows using digital assets of various types or editing digital content such as video clips.

Creation and adaptation of DLRs are linked to issues of ownership and control. Ownership develops where the teacher is able to create and adapt content fit for purpose and of suitable quality. Sense of control develops as the teacher can ensure that a particular DLR will work as it is expected; for example, being able to play a particular video clip regardless of the room in which they will teach.

For the more experienced users, control over DLRs can be exercised by, for example, buying some of the support software for personal use or by posting content using their own independent website. However, as mentioned in section 2.2 currently, developing or adapting DLRs is time-consuming and requires knowledge and skills that not all teachers posses. Control therefore, goes hand-in-hand with competence.

Secondary schools tend to require more DLR autonomy and control. Primary teachers appeared to prefer sharing DLRs. This could be due to subject specialism and staff specialism within secondary education.

2.6 Needs and desires of DLRs

Participants were explicitly asked what they needed and wanted from DLRs. While their answers to this question were diverse, a series of common needs and expectations were identified and are discussed below.

The main requirement for DLRs is that they must be flexible. DLRs are expected to fit within different teaching styles and strategies and to be easily adaptable. Nonetheless, teachers are quite clear that a DLR cannot be everything for everyone.

However, teachers need to be able to easily adapt DLRs to their specific teaching needs, such as using resources with a whole class or individual learners; changing the language to suit the age range of the children; extending or reducing lesson content and learning tasks to be carried out; or personalizing the look and feel of the resource - including fonts sizes, colors and local images or content, which is seen as a further advantage when working with SEN children.

Flexibility extends to the possibility of using a particular DLR regardless of the equipment available for interacting with it, e.g. diversity of IWBs, classroom computers or portable devices.

DLRs are also required to enhance, that is, add value to the teaching and learning process; therefore meaningful learning activities and different options for assessment and feedback are features highly regarded by teachers. It is also expected that feedback can be used to personalize learning tasks for each child. This in turn implies that DLRs are valued where they provide teachers with facilities for keeping track and monitoring individual progress.

In addition, with the higher uptake of Learning Platforms, DLRs are expected to easily fit within the school platform, providing anywhere and anytime access for teachers and children. E-safety was an issue widely discussed. In one extreme, some teachers are afraid of exposing pupils to inappropriate content and therefore avoid online interactions. In the other extreme are teachers who consider e-safety as a basic requirement, but not to the point of blocking content (e.g. websites, video clips, and images) teachers had researched at home. In such cases, filters and firewalls are seen as blockers.

Staff training and development opportunities were highlighted as important needs. Strategies such as networking with other teachers either internally or externally through teacher training days specifically designed to address DLR issues were seen as quite effective.

Effective use of DLRs in teaching is reliant upon a diverse range of factors. These to a certain extent increase the perceived risk of using DLRs, suggesting in turn that DLR flexibility and teacher competence are core to managing that use.

2.7 Quality Criteria for DLRs

Teachers were asked to draw upon their experience to identify the quality criteria they employ in the selection and rejection of DLRs. Criteria that were commonly used to judge fitness for purpose and quality of DLRs were:

- Contextualization, in terms of teaching needs (subject, type of resource, curriculum, key stage, type of lesson activity, type of technology being used, type of learner etc)
- Suitability and relevance
- Accurate and trustworthy content
- Reusability and interoperability: could resources be identified at component level and easily integrated with other resources? Would they work on all LPs?

Additional relevant factors included: the ease of finding DLRs, their cost and whether they were presented in a jargon free manner. Conversely, reasons why a DLR might not be selected consistently focused on issues regarding how DLRs are presented to teachers. There were references to "*too much language*" and " *too high a level of language used*".
When asked how a DLR was chosen, the key message was one's experiential assessment using a trial or demo version of a DLR. Once working at this level, "*appropriateness"* and *"personal judgment*" were employed.

Teachers' priorities lie within pedagogic principles. In particular the data clearly shows matches to the Curriculum and assessment to support learning to be very highly rated by teachers.

3. Implications for further development

Teachers may be characterized as time-poor, task-oriented and heavily dependent on online searching facilities to locate digital resources. They are convinced of the value of ICT but they are not interested in becoming technical experts. Teachers are keen to use what they know and what they think is reliable, only some of them are prepared to spend time experimenting. Participants in this research added that teachers place trust in the judgment of other teachers, and that preparation time and inclination are two vital ingredients to using DLRs, whilst trust is also a major concern.

For teachers, issues center on perceptions of the risks which DLRs pose to effective teaching and personal teaching capabilities. These perceptions of risk are balanced by the recognition of the potential for DLRs to improve teaching practice.
Some suggestions derived through the research focused on organizational change to provide guidance and support, instill confidence and technical knowledge, and to enhance both knowledge and practice of DLR enhanced teaching and learning:

- Demonstrator activities can be designed and tailored to show how DLRs are successfully employed in class teaching situations and to illustrate the benefits to both teachers and learners.
- Support and education activities can help teachers recognize how best to manage and counter risks. For example, DLR supported teaching in CPD programs, with the emphasis on teaching and learning outputs, not technical skills.
- Leadership initiatives can be created to facilitate the development of teaching practices and pedagogies appropriate to the digital environment. The use of DLRs and tools is relatively immature and teachers and learners are developing their understanding of what works and what might be possible.

- Use champions, experts and other exemplar personnel can be used to encourage sharing of success and effective practice.
- In supporting decision making, LA and other ICT advisors can be expected to be authoritative about the appropriateness and quality of e-learning tools and content.

3.1 DLR expectations and requirements

Regarding teachers' expectations and requirements of digital learning resources, our research highlighted the need for better tools and resources to be more widely available and flexible enough to adapt to teachers' and learners' needs.

E-learning tools and resources need to add interest to lessons and help engage learners. They key words mined from the data collected in this research include: *flexible, interactive, stimulating, motivating, attractive, adaptable, easy to use,* and *suitable.* Contextualized content is vital for teachers. Clear learning objectives, linked to the National Curriculum, indicating age groups, key stages and ability levels supported are a must for digital content.

Flexibility requires content of different granularity. Teachers may, for example, look for specific assets or pieces of information, but they can also look for ideas, schemes of work, lesson plans or interactive content. Flexibility also refers to the suitability of resources to fit to different teaching styles and strategies, as well as different approaches to learning.

Considering that teachers have no time to experiment, providing easy to use, easy to learn e-learning is important DLRs are expected to provide familiar interaction styles, layouts and functionality, following industry conventions, patterns and standards thus is crucial.

To mitigate the perceived risks that e-learning poses to effective teaching, providing support for developing "plan-B" can be advisable; for example, providing low-tech alternatives for digital content such as printable resources.

Technical configuration of equipment available in schools is diverse, e-learning tools and content cannot assume availability of extensive resources (memory, disk space, etc.). Furthermore, different standards (e.g. IWB) make interoperability a key requirement.

As the project has shown, not enough is known about how, where and why e-learning works, with some sectors less well understood than others. Future improvements in DLRs and, more generally, developments to enhance the effective use of e-learning technologies depends on better understanding of the needs of teachers and learners. This study has outlined some areas of that understanding, but more is needed.

Notes

1. At the time of writing this report, the UK Government had announced a package of public sector savings which includes the planned closure of BECTA.

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