2005

StoryBook: Extending a personalised interactive learning environment to children with severe learning disabilities

Michael Collins
Edith Cowan University

Sundrakanthi Singh
Edith Cowan University

Storybook: Extending a personalised interactive learning environment to children with severe learning disabilities

Abstract

Not all recipients of eLearning map well for measurement by such as the Kirkpatrick model, especially young students with severe learning disabilities. *StoryBook* is a tool specifically designed to aid teachers to create and include a simple, enjoyable, tailored interactive computer-based audio/visual learning environment as part of a custom curriculum for such students. In it, stories are currently gathered into libraries suitable for unique individuals or more common content, on a local, classroom basis.

We describe prototype software for eLearning for such students, already trialled in a special educational unit in Perth, Western Australia. We then outline plans for a second version that takes advantage of facilities of broadband to bring that software into home and school environments alike and which offers extended library management facilities. The current environment offers a framework wherein teachers may craft a story using image and sound files that students may navigate by means of a touch screen. Emphasis has been placed upon simplicity for both author and reader. Initial testing of the product yielded a "wish-list" from teachers to be incorporated, together with technological advancements, into the second version.

The proposed environment offers "enwebment" of the existing product, the capture of statistics for later analysis, increased librarian facilities to permit greater access to stories by individuals and public alike so that stories may be accumulated and shared where appropriate. The advent of broadband permits access to a web-server for files, viewed and played via standard browser software such that a student's progress may be continued between home and school, or even when travelling. It is anticipated that the second phase will commence testing in early 2006 and a local further education (TAFE) college has expressed interest in using the tool for language education.

ISBN 0-7298-0613-8,

Introduction

Commonly, children with severe learning disabilities are at a disadvantage when taught in traditional environments. Their progress may suffer frequent setbacks and may not map well for measurement onto such as the Kirkpatrick model of: reaction, learning, transfer of knowledge and results. Ideally, they need special curricula designed to realise given educational tasks that others may take for granted, e.g. recognition and response to events or entities. In some cases, the events and/or entities may be synthesised via picture and sound recognition by incorporating an interactive computer into their learning environment. Such incorporation may effectively enlarge that environment to a virtual infinity or, at least, bounds realised by the computer software and available electronic communications media. Such curricula build on an individual student's strengths and compensate for their disabilities by the use of assistive technology, enabling them to perform given tasks better (Lewis, 1998). Teachers may use equipment, e.g. touch screens with special software, to create a flexible interactive computer-based environment per student – an environment that may usefully be extended to enhance the student experience and facility by integration with the internet.

Such an environment is especially apposite for students with severe learning disabilities as it caters for their unique needs. Clearly, they do not fit with the progression enveloped in the Kirkpatrick Model's four steps of: Reaction, Learning, Behavior and Results (Tamkin, Yarnall & Kerrin, 2002) - unless by direct observation of teacher or other facilitator. However, teachers are able to centre this environment upon those objects and concepts found to be of interest and concern to the student (Ballinger, 1999). In this way, a student's motivation to learn is maintained; that being considered critical to the learning process (Ballinger, 1999). Even in most severe cases of learning disability, barriers of unfamiliarity may be removed and a sense of recognition and achievement instilled in the student.

StoryBook is an assistive tool designed for the creation and use of interactive computer-based environments that we propose to extend beyond the bounds of a single computer via common eLearning strategies. Teachers may include tailored, familiar picture and sound files that a student follows sequentially, via screen hot spots, to create an educational story. The use of graphical representations of objects instead of text enables students, especially those with little literacy, to navigate and comprehend the story with greater ease (Cernuzzi & Sanchez, 1998), especially when used in conjunction with a touch screen. All of this provides a more simple, direct and intuitive process for object selection when compared to using a mouse (Microsoft Corporation 2002).

Although commercial software exists that reinforces the association between on-screen objects and their descriptions, such software is:

- expensive;
- not readily configurable;
- often aimed at too high a level;
- bewildering, in that too many objects/sounds are presented concurrently.

ISBN 0-7298-0613-8,

In such applications, students with severe disabilities may have their isolation reinforced.

StoryBook is currently a unique, novel tool that facilitates complete customisation of its content, thereby allowing teachers to use one package for their students who have severe disabilities to progress through educational stages. *StoryBook* places emphasis on teachers designing content to welcome and encourage *their* students individually rather than accepting content designed for a more general mass market. Furthermore, *StoryBook* interacts with a student satisfactorily enough that a teacher may move onto other students, with occasional/appropriate returns to check the initial student's progress – the tool acting as a sort of automated friend to the student. It was noted that, once a story was crafted to suitable standards, suitably informed parents may then facilitate the student's progress. Therefore, the proposed eLearning extensions will maintain the established simplicity and functionality offered by the current software. The extensions will permit greater flexibility in parental involvement, tracking by parent and teacher alike in a student's progress and a relatively seamless continuity between school, home or other place having broadband internet access.

Background

General background

The supply and support of technology for students with special learning needs has often evolved in isolation from general State, Territory and sector-based initiatives (Cormack, Couch & McColl, 2000). While there is limited availability and access of computer peripherals and assistive technology for students with disabilities through separate Commonwealth and State funds some government sectors have established resource units for students with disabilities. These units provide advice as well as libraries of adaptive equipment for loan to schools. In some States, non-government organisations obtain funding for devices and computers and provide specialist support to schools, for example, disability-related organisations support children with physical, sensory or intellectual disabilities (Cormack, Couch & McColl, 2000).

There are many factors that impact on the use of computer technology in classrooms, for example teacher attitudes, personal beliefs and dispositions towards technology, teacher training and release time, students' needs and desires and the curriculum foundation (Hasselbring & Glaser, 2000). The impact of teacher attitudes on the successful use of computers in classrooms is an important factor and deserves further consideration. For instance, Drenoyianni and Selwood (1998) state that this is influenced by teachers' personal beliefs about technology, and Saye, (1998) found that teachers' disposition towards technology has an impact on classroom use. Teacher release time is another factor impacting upon use of computers in classrooms. Several writers have advocated increased release time for teachers to develop programs for students with disabilities, especially when integrating computer-based technology into classroom practice (Becker, 1998; Brodwin, 2004; Florian & Hegarty, 2004; Minero & Brothers, 1999; Saye, 1998; Todis, 1996). To facilitate

ISBN 0-7298-0613-8,

the integration of computer use in classroom, Woolley (1998) suggests that it is useful for teachers to maintain a focus on technology supported learning processes such as communication, rather than the technology itself. She advocated student need and desired learning outcomes as the starting point for the use of computers in classrooms. Cooley (1998) argues that the success of including technology in classroom practice is contingent upon a strong curriculum foundation (p A24). However, for students with limited communication skills and severe intellectual disabilities, assessing academic levels and determining program objectives proves difficult. With these students, responses and achievements can be subtle and standardised tests are not always appropriate (Hand, 1994). With the use of this technology, it is necessary, initially, to teach students to respond; teachers could then assess their cognitive abilities and establish appropriate technology-based program goals.

Particular background

This particular project commenced with a request from a Perth (W.A.) Special Education Unit for software to include interactive computer-based content in curricula specifically for students isolated by severe learning disabilities. Such content was envisaged to support learning by offering an opportunity to evaluate the student's recognition of their personal environment, e.g. by using images and sounds of family members and everyday objects.

In short, the software needed to be:

- configurable by the teacher, enabling the production of custom interactive stories that present pictures and sounds in a way that encourages students to navigate to other pictures using a touch screen;
- simple enough for the student to understand and be interested in both the content displayed and the response expected;
- sufficiently interactive so that the student may be left to relate to it (albeit under supervision or facilitation by suitable person(s) in the immediate area);
- readily available to the school and possibly other schools in the W.A. education system, for educational and research purposes.

Following development of a prototype, teachers from the Special Education Unit participated in a training day where they were able to conduct a trial. Such training is consistent with Smyth's (1997) statement that "the key to a successful technology program is ... the professional development of teachers" (p. 4). Teachers noted that having an understanding of the technology influenced their instructional aims. Accordingly, they valued continued on-the-job training, a notion supported in the literature (Becker, 1998; McGregor & Pachuski, 1996; Minero & Brothers, 1999). In this case, positive acceptance led to the developed software being installed for "in-principle" trials with students.

The StoryBook Environment

Effective learning programs for students with disabilities reflect a number of collaborative practices and the use of multidisciplinary teams. Research on the introduction of technology-based education programs emphasises the importance of this teaching practice (Bryant & Bryant, 1998; McGregor &

Pachuski, 1996; Todis, 1996;). The value of collaboration and shared thinking is therefore an important consideration when integrating assistive technology into the special education environment.

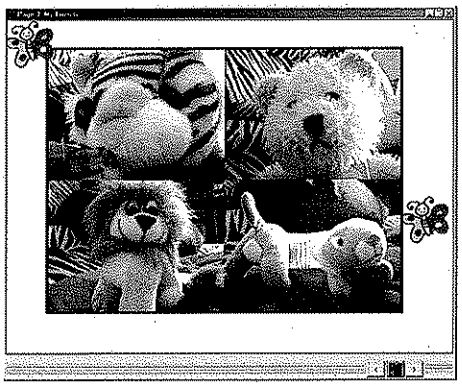

Figure 1: *StoryBook* stories consist of pages. The main element of a page is the background image. Here the student is presented with four choices.

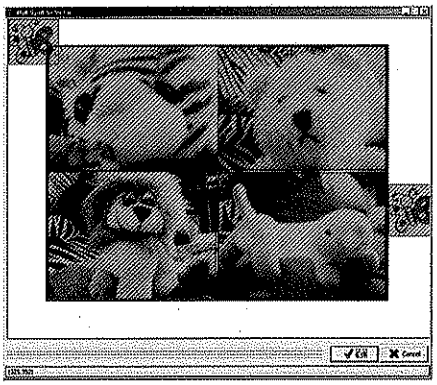

Figure 2: Hot spots located over the background image to allow students to interact with the story.

StoryBook is designed with and for Special Education teachers wishing to include very simple interactive computer-based content as part of their students' curricula. We now discuss the major components of the *StoryBook* application, *StoryBook Reader* and *StoryBook Editor*.

Each story comprises several pages. When combined these provide an environment allowing a student, within constraints, to choose what they want to see and do. In this, a limited number of options are presented from which the student chooses a path through the story. Each story page is characterised by the following elements:

1. a link to an image file displayed on-screen;
2. a link to an associated sound file used to provide instructions or positive reinforcement;
3. hot spots that allow the student to interact with the background image displayed.

By way of example, Figure 1 shows a page from a demonstration story. This page contains a background image displaying four pictures of a student's favourite toys. A "hot spot", sensitive to a students' touch, surrounds each toy. Each hot spot links the current page to another allowing greater interaction with the selected toy. The shaded regions in Figure 2 delimit the size of and locate each of the hot spots.

Assume the student has touched the lower left hand picture (Leo). In this example story, a new page is programmed to appear on screen containing a larger image of the chosen toy (Figure 3), whereupon the system waits for the student to touch different areas of the new screen following an instructional voice prompt derived from

an associated sound file. If the student does not touch the screen, the prompt is repeated every thirty seconds. In this example, the voice prompt suggests how the student may interact with this page: "*Hello, I am Leo, push my nose, press my eyes, tickle my feet and pull my tail to go back.*" The student may touch the on-screen areas suggested. A subsequent voice prompt acknowledges the student's action.

The example described shows how hot spots may be used to present interactive content and provide navigation through a story. Teachers may define the following hot spot actions while creating the story:

- play a sound file;
- display a new image on screen;
- navigate to a different page.

Story creation begins in *StoryBook Editor* with a cover-page. This greets the student, displaying an image and playing an optional sound file. The example cover-page configuration is shown in Figure 4. Teachers associate image and sound files to display and replay when the student views the story.

The next step in story creation requires the construction of pages (see Figure 5) containing interactive content controlled by hot spots. To create pages, teachers associate the image and sound files to display and replay, then create hot spots via the *Hot Spot Selector* shown in Figure 6. Teachers may "draw", resize and reposition hot spots over the current page's background image in a similar way to drawing a rectangle while using a conventional drawing package.

Figure 3: A new page appears on screen containing a larger image of the toy.

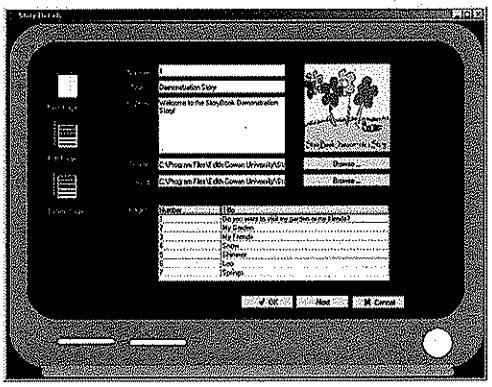

Figure 4: The cover page editor allows teachers to introduce the story.

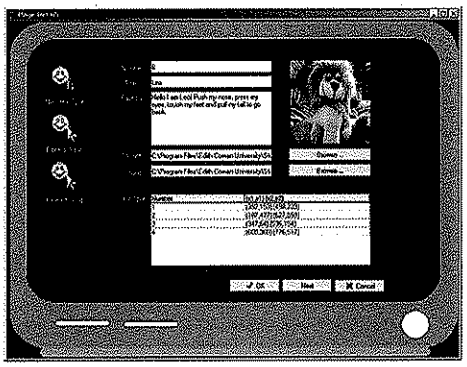

Figure 5: The page editor, allows teachers to create pages for their story.

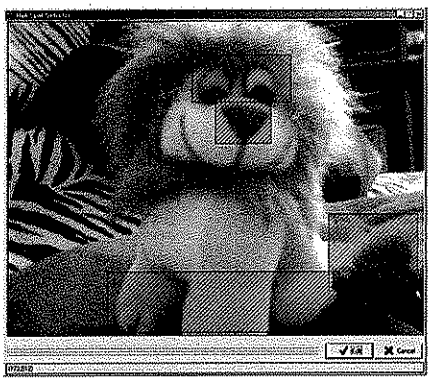

Figure 6: The *Hot Spot Selector* allows teachers to "draw" hot spots onto the screen.

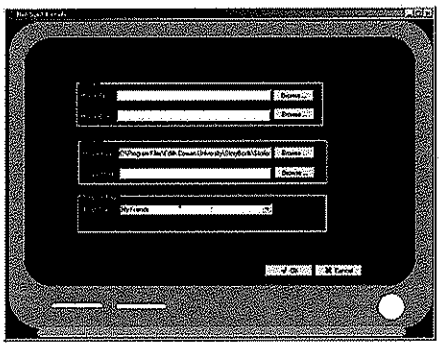

Figure 7: The hot spot editor allows teachers to configure hot spots – adding picture and sound files.

Once the position and size of a hot spot have been determined, the teacher may link image and sound files to the various activities supported by hot spots as shown in Figure 7.

StoryBook implements a login based system where each student has an account. Each account has an associated library containing specifically designed stories. Teachers may copy stories between accounts to allow the re-use of stories suitable for more than one student.

Teachers may create stories of virtually any length and complexity using the interface provided. They are free to use any bitmap (.bmp) and sound (.wav) files available, or to create their own, producing visual/aural stories tailored to the individual needs of any given student.

We anticipate that both students and teachers will benefit from the ability to include an interactive computer-based learning environment in a student's individual curriculum: one tailored to suit student needs, reduce isolation and to

maintain student motivation throughout their education.

Conclusion, ongoing and future work

StoryBook is a tool specifically designed to aid teachers to create and include an enjoyable, tailored interactive computer-based audio/visual learning environment as part of a custom curriculum for students with severe learning disabilities. It engenders a sense of recognition and achievement in a student.

A major strength of *StoryBook* is its deliberate simplicity, allowing teachers to create stories designed to suit the needs of students with ease. By using available image and sound files of familiar objects, an interactive story centred on real aspects of the student's life may be crafted. Focusing upon objects and concepts known to be of interest and concern to the student is beneficial, helping to maintain the student's motivation to learn.

Unlike other commercial software packages, *StoryBook's* content is completely customisable, whereby a teacher uses one application that is tailored differently for each student's needs.

In terms of ongoing and future work, wider trials and implementation of this assistive technology and software would require economies of scale and sector based funding to develop potential niche education support centres. Ideally, such centres would then offer a type of specialism that adds value to programmes for intellectually disabled children. The introduction of this assistive technology would also require further exploration of issues of classroom practice related to, for example, teacher attitudes towards computer-based learning for students with disabilities, computer training for teachers, changes in teaching methodology, enhanced multidisciplinary collaboration and teamwork, and revised curriculum processes involved in program planning and implementation for individual students. However, in terms of practical development within the funds available, we propose the following realisable developments.

So far, evaluation has been purely qualitative, in that teachers and teaching aides alike have expressed satisfaction with the tool. Students have been observed to improve their recognition skills, but such is difficult to measure. Accordingly, the next generation of *StoryBook* will incorporate the following:

- monitoring of response time and event capture to perform quantitative capture and evaluation in terms of statistical and trend analyses to assist teachers to progress each student according to their advances;
- stories may be held, edited and played on a local machine, then updated automatically on a web server;
- increased library functionality to permit sharing of stories;
- ability for parents/carers to log in to supervise students;
- seamless transfer of story status and ongoing statistical capture between a student's school and home environments, so that they may "work" with "their" story outside of school hours; and
- multiple instances of the same story object may be progressed by different students.

ISBN 0-7298-0613-8,

It is hoped that production of an eLearning *StoryBook* as proof of concept will attract sector based funding and/or grants to refine it for use in and benefit of the wider community.

ISBN 0-7298-0613-8,