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Evaluating the use of multimedia authoring with dyslexic learners: a case study

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Abstract

This paper reports on the findings of a case study set up to explore the possible benefits that dyslexic learners might have when engaging in the creation of their own multimedia project. Two children with specific learning difficulties worked with the author to develop a multimedia presentation. The children developed authoring skills (such as planning and drafting, composition, revision and reflection, proof reading and presentation) and became active, motivated learners. It is believed that the open-ended character of a multimedia authoring package can encourage creative thinking and interest for content and style of presentation.

Introduction

As children start school, they are expected to adapt to the classroom culture and embrace the conventions it sets. When the difficulties they face in adopting the classroom written symbolism are thought of as involuntary, a consequence of some genetically determined disorder that reflects insufficient phonological processing abilities (Orton Dyslexia Society, 1994), the term "developmental dyslexia" (Coltheart *et al.,* 1994) may be appropriate to describe the children's difficulty.

The connotations of the term "dyslexia", having the term "lexis" (word) in its second part, are associated primarily with script and refer to problems mainly encountered in the educational setting where words are the basic representations of ideas and meanings. Poor performance in writing, spelling or reading alerts the teacher to the possibility the learner may be dyslexic. Further examination of the syndrome might also reveal the existence of difficulties in mental arithmetic, sequencing and spatial awareness. Moreover, poor short-term visual or auditory memory, small concentration span,

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confusion in distinction between figurative and literal expressions, and speech difficulties (Stackhouse and Wells, 1997) can be apparent.

The introduction of multimedia computer applications in everyday lives and activities has given dyslexic learners the possibility to approach information and scaffold their ideas in a variety of ways with the assistance of a familiar medium closely related to their interests and playtime activities; for instance, computer games. Multimedia applications such as CD-ROMs or the World Wide Web consist of a mixture of text, sounds, video clips, still or animated images, and the information can be organised in a non-linear sequence. Sounds and images make the content of the programs more accessible to dyslexic learners who sometimes find it difficult to decode and interpret solely text-based information (Dimitriadi, 1999). In addition, when text is presented in these products, it either comes in small chunks, or key words are used to trigger the user's attention (*op. cit.*, 1999). Script does not lose its prestigious position but, through the incorporation of other expressive media in the creative process, the access to it is facilitated.

This multimedia presentational mode accords with the suggested specialised teaching approaches advocated for people with dyslexia (Hornsby and Shear, 1993; Hickey, 1977). Uncertainty about the typology of the syndrome (Stackhouse and Wells, 1997) as well as qualitative differences in performance among the dyslexic population, have led experts to postulate that teaching for dyslexic children should be on a multisensory instructional basis (Thomson and Walkins, 1998), where all the perceptual modalities of speech, vision, hearing, touch (and taste as well if possible) are integrated in the promotion and development of cognitive functions, such as reading, spelling and writing, that have failed to develop as automatic processes. Literature has supported the assumption that, in this way, the stronger cognitive areas and sensual modalities will assist the processing and retaining of information (Pollock and Waller, 1994). The organisation of the learning material in phonic clusters with the use of overlearning (repetition) is also recommended.

Popular CD ROMs such as *Wordshark 2L* or *Starspell 2001*, provide spelling activities in a multisensory environment. They are useful in reinforcing information, especially as they can offer the facility to record additional word lists, but they can limit the users on performance tasks in which they have to find correct spelling, without explaining to the learners the strategy to follow in order to come up with the answer. In addition, the type of mistakes the learners make is not recorded for future reference. The users are passive in the sense that the material and the activities are already there and they just reorder them (Lachs and William, 1998). Such applications, in the author's view, may emphasise the learning of skills which are necessary for dyslexic learners but without necessarily expanding them into contextual use, nor involving pupils in the authoring of their own on-screen tasks. In this way they leave out the creative aspect of writing, that is the process of reflecting on ideas, viewing information critically, solving problems with imagination and compromise and making decisions about what is important in order to make a project interactive and usable by an audience (Lachs, 2000). Table 1 indicates these points as they are incorporated in the revised National Curriculum

Table 1: Skills and processes involved in authoring

Processes of compositional writing	*Issues involved in the development of compositional writing*	*Evaluation criteria*
Planning and Drafting	Choice of topic and genre; recognising key words in the question; focus of the work; brainstorming ideas; taking into consideration the audience; rehearsal	Planning diagrams, notes, drawings; talks in a positive and relaxing way
Composition	Vocabulary choice; style, tone and language appropriate to the audience; order; humour	Vocabulary is wide; use of language and style appropriate to the audience; use features of presentation and organisation
Revision (Reflection)	Taking ownership of the product; changing the draft	The narrator's voice is consistent; tense is consistent; reasons are given for changes; prepared to contribute; asks questions (that are relevant) and listens to the answers
Proof-reading	Grapheme-phoneme correspondence; spelling rules; capitalisation; punctuation, morphology	Use of appropriate terminology; use of standard English; relevance of word families; spelling of words; language structure; grammar and syntax
Handwriting and Presentation	Appropriateness of stylistic devices such as fonts, colours; inclusion of other media such as pictures, diagrams	Can discuss the choice of different forms and styles of writing for different purposes; discusses the importance of having a clear and neat presentation

for English (Writing—Key Stage 2) and in the work of Graves (1983) on the development of authoring skills.

In contrast to the conventional computer-based tasks advocated for dyslexic pupils as described above, **multimedia authoring programs** combine the multisensory environment required for dyslexic learners and are content-free for pupils to develop their own ideas and in this way they emphasise the creative process. The computer-based instruction advocated for dyslexic learners might become more effective as the pupils are actively involved in the learning process on tasks meaningful to them. The term "meaningful" relates to ideas relevant to their experiences and interests or topics "that embody some function or purpose that children understand" (Newman, 1997, 280).

The aim of the project reported here was to explore whether the architectural structure of a multimedia authoring package could encourage dyslexic children to engage in

language activities and develop authoring skills, both tasks being considered difficult for such learners. More specifically, it was expected that the processes of authoring as identified in Table 1 would be developed with the new medium of instruction.

Method

Design

The project was conceived as a case-study in which the author would work with two children on a multimedia package (*Hyperstudio*) during a school term. The children were informed that they were free to withdraw from the study at any time. We arranged to meet twice a week for 50 minutes. In the end, some of the 22 sessions lasted longer than an hour. A previous, similar project (Dimitriadi, 1999) indicated that pre-requisites in applying such an idea at school are equipment and time for staff training. This was not feasible, as the project happened to coincide with the launching of the National Literacy Hour which was the school's priority. Moreover, as the focus was on learners with dyslexia, the work necessitated the participation of at least two dyslexic pupils from the same classroom, which was not easy to find at the time. Therefore, it was decided to work with the children after school in their home environment.

The sessions took the form of a workshop as one of the most important aspects in developing authoring skills is conferencing with the children (Graves, 1983), that is discussing the content and the process of their work. The researcher offered "instructional scaffolding" (Smith, 1994) by introducing the program to the children and asking questions to encourage their initial planning. However, the topic of the project was the children's idea. Any spelling patterns taught would emerge from the children's own work. The researcher's role was mainly that of the technical facilitator and advisor at the children's request. Pair work was also considered necessary as "sharing could provide motivation" (Graves, 1983, 60).

Participants

Two English monolingual children, a brother (D.) and a sister (C.), aged 8 and 10 respectively, participated in the project. Discussion with their classroom teachers and evaluation of their medical records showed discrepancy between their academic performance and their general abilities. An initial profiling of their reading, spelling and maths skills showed a consistency to their poor school results (Table 2). Their mistakes revealed partial knowledge of phoneme-grapheme correspondence and of orthographic rules, even in spelling patterns already taught at school. Poor concentration span, limited sight vocabulary and dislike towards script were also apparent.

Materials

Hyperstudio was the multimedia-authoring program used in the project. It is a content-free program running on most platforms. It allows children to combine text, graphics, animation, sound and video clips in a series of cards called "stacks" (Druin and Solomon, 1996). The transition between the cards takes place through "buttons" that act as "hot links". The program resembles a word processing or a drawing package. There is a spell checker, and a storyboard to assist the users in visually mapping the whole project.

Table 2: The children's educational profile

Age (y:m)	*Child C*	*Child D*
Age	*10:0*	*8:2*
Reading Age	*7:0*	*6:0*
Spelling Age	*8:0*	*7:0*
Maths Age	*10:0*	*8:9*

Procedure

In order to record the process of the work as accurately as possible, the sessions were videotaped with the permission of the children's parents; the researcher also took notes. At the beginning and at the end of each session the children were asked to comment on the session, to state what they liked and disliked, and to discuss their plan for the following session. The researcher wrote these comments in a notepad that stayed with the children to help them remember the content of each session.

Results

Planning and Drafting

The children did not find the *Hyperstudio* program difficult. Their response to it was positive from the beginning. They even learnt how to use advanced techniques such as creating their own animated graphics. They thought of it as a bank of resources that could facilitate the creative process. "It's easier on the computer! It takes ages to write down a story!" C. said. "And you've got more stuff you can put in without using any scissors!", D. added. They were given a notebook to write down ideas, to design the cards before using the computer. They used it regularly to write down their speech before recording it onto the computer, to draft some of the sports information sections and to design their mindmaps.

During the first session they were introduced to the idea of multimedia by exploring two professional CD-ROMs and a previous multimedia project completed by other children. They came up with a working definition of multimedia in order to create a framework for their own project. "Multimedia has got pictures, sounds, words and movements" D. said. The idea for their project came from the associations they made to what they saw on the CD-ROMS as one of them was on the muscles and bones of the human body. D. enjoyed the animated graphics and the sounds he heard on the CD-ROMS and he described the animated clips as "movements". C. expanded the idea by saying that "Sports can be movements" and D. shouted "A movie on skeletons ... dinosaurs!", relating it to a recent school visit to a science museum.

The children worked together on most of the ideas but not to the extent expected. The girl, perhaps because she was older, tended to dominate the process. She wanted to do most of the writing and the drawing, despite the fact she had more problems in spelling and writing than her brother did.

Although both children knew about dinosaurs, they preferred to do a series of cards with factual information on sports. "I'll do the football page and they will click on the dinosaur and they will have loads and loads of information on football ... and pictures. There will be a card with buttons to go to each sport." C. said. "[Apart from text and pictures] we can put our voices for people who can't read." D. said.

"Football" was the first card they designed. We discussed what to include in that section and the children decided that information on rules, players and the setting were important. One of the cards included the information and the second card showed the setting and a video clip to demonstrate how the game is played.

They started developing more autonomy over the compositional process in the "Swimming" card, where they set up questions to make the card more interactive. On the "Running" card the children composed and typed the descriptive passage on their own and they included a video clip to actually show the sport.

The children had intended to include more sports such as "Gymnastics" and they prepared a mindmap for the card. Due to lack of time they never developed it. It was interesting that the spellings and the vocabulary used in that mindmap, which was among the last ones, are more elaborate than ones designed earlier in the project.

Composition

The project the children produced was in dialogue form. That is, the children used questions and talked directly to the audience: "Click on one of the sports!" (Contents Card), "Click the button when you finish. OK?" (Title card). The voice of a sports commentator describing the game is heard on the "Tennis" and the "Rugby" card. "Football" and "Rugby" also show highlights of the match at the click of a button. The children also designed a "Game" card, so that "the people who watch the sports can have some fun". At the drafting section of their work the children used a lot of colloquialisms such as "goalie" instead of "goalkeeper" but, when they revisited the passages later, they changed some of the initial wording using more formal terminology.

The finished product resembles the classical structure of a book. It begins with a title page-card (Figure 1) followed by a content page-card (Figure 2). Almost every card (apart from the "Football Pitch" card) is linked to the contents page with a "Back" button. Each sport is represented in just one card (apart from "Football").

It might seem disappointing that the children developed the product in a horizontal structure, more like a pop-up book, where things appear at the click of buttons, rather than interrelating with other cards. However, the author feels that this could show the children's emphasis on enriching and developing the content of the card instead of getting bored and moving on to the next one. Lack of time did not permit the researcher to find out whether they would move on to creating more connections between the cards.

Figure 1

Revision (Reflection)
The children moved back and forth between the cards, trying out sounds, animated graphics and reading the information they had typed. Each time they added a button on one of the cards, a whole series of questions concerning the things to do, places to go and the style of the transition to the other card, came in menu boxes and the children had to make their choices before proceeding. Although it was, at first, difficult for them to read all the words on the tool bar at the top of the screen and in the drop-down menus, they slowly improved and they developed a sight vocabulary for these words.

The initial information about the children showed their reluctance to undertake tasks related to written language (reading and writing). From Session 1, however, language was introduced in the form of textual information from the professional CD-ROM presented to the children. While C. was more reluctant to read ready-made text on the screen, she was very keen to read back passages that she herself had composed and very attentive when her brother missed two lines from her story while audio-recording the information on the football card.

Proof-reading
The children mentioned the spell checker as an advantage in computers but they never used it. They preferred to ask the researcher instead. Feeling more relaxed about

Figure 2

correcting the script, C., who was described by her teacher as a girl who dislikes writing, composed a passage on football on her own in less than five minutes. Equally important was the fact that she went back and improved both the layout as well as the spelling and punctuation of the card in various other sessions. Here is an example of a dialogue that occurred:

"Can you tell us how to spell dinosaurs?" she asked the researcher while working on the title card.
"Write it down as you think it is and we can check it together", the researcher said.
"I"ll do it", D shouted.
"No! I"ll do "dinosaurs" and you can do "doing" and then I can do "sports"!
Let me do it", C said grabbing the mouse out of D's hand.

The final version of this card is shown in Figure 3.

The children's vocabulary developed both in terms of technical terminology, with words such as "animation", "stacks", "scanner", but also of context-based words found either on the drafts in their notebook or in the actual passage, such as "equipment", instead of "things", "players" instead of "people", "setting" instead of "place".

When sound was selected as the presentational mode of the information, the children prepared the passage in their notebook and rehearsed it before the actual recording.

Figure 3

The researcher found the opportunity then to interfere meaningfully in the learning process with a brief introduction of spelling points that were present in the children's composed texts. These included:

- Punctuation (the use of comma, full stops).
- Long and short vowel sounds.
- Syllabification.
- /ch/ rules.
- Flossies (-ll, -ff, -ss).
- /k/ rules.

When the children felt motivated to construct their thoughts in written format, the researcher did not interrupt their flow of ideas and discussed spelling, syntactic or grammatical points at a later stage. This gave the children the opportunity to revise the form and the content of the passage. At the end of each session the researcher asked the children both orally and written to check a list of words that included the spelling patterns introduced during the session.

Handwriting and Presentation

Superficially, the final product suggests that the children's preferred media were drawing, and recording speech, but a closer examination, and consideration of the session

transcripts, indicate that written language was evident in most cards. The passages were neatly put in "boxes" and placed on various parts on the cards with the "Back" button being consistently kept at the same place. They put an emphasis on selecting a "readable" type, size and colour of fonts. They chose to scan the photographs of the football players and use the digital camera to take a picture of their garden. They also paid attention to details such as the ground on the video clip to match the ground on the background and that it did not look "real" to have many clouds in the sky pattern. There was no evidence from their work that their handwriting improved.

Discussion and Conclusions

This project aimed to examine whether the multimedia environment of a computer content-free program could help dyslexic learners to develop initiatives and autonomy in the writing process. This question becomes vital in the field of dyslexia, as children, when frustrated by their failure at school, need meaningful ways to approach script. The package developed here combines the multisensory learning setting advocated for dyslexic learners with the open-ended character of the teaching sessions to let them develop their creative skills.

The *Hyperstudio* program became a medium of exploration not only of technical features of this particular software application, but also of ideas. It gave meaning to activities that on paper seemed laborious and boring. The children were motivated throughout the project and they discussed it at school. They had an active role, negotiating ideas about the presentation and the purpose of the project. It gave the researcher the chance to discuss spelling patterns and paragraph structure in a content meaningful for the children, following their ideas.

The project did take time to develop as, during each session the children came up with more ideas and changes to the original plan, in that the changes were meaningful, both to the content and the format of the project.

The results of the final reading and writing skills assessment, a month after the end of the project, indicated partial improvement in spelling patterns discussed during the process. The children were also able to read fluently the passages they had constructed ("Football", "Running") and the technical words of the program, off the screen, when presented on separate pieces of paper. In addition, they were able to map an outline of the project on paper and discuss how they designed each card.

Future research in the field would benefit from observing children's authoring work off the computer to see how they can transfer the skills developed in the new environment in other settings.

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