Multimedia Workshop: collective production in learning management systems with the aim of PSN digital inclusion

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Abstract: As a proposal in the search for Information and Communication Technology and as a resource for the development and inclusion of persons with special needs (PSNs), we present, in this article, the Multimedia Workshop tool. This tool aims to open up spaces for the creation of collective/individual multimedia documents, in a manner accessible to PSNs, and involving the following concepts in its development: flexibility, interactivity, portability, expansibility, reusability, collaboration/cooperation and accessibility. With this new resource, which is part of the Learning Management System - Eduquito, we are expanding the number of alternatives to overcome technological barriers in the process of digital and social inclusion for PSNs, as well as promoting their communication and socio-cognitive development.

Keywords: Collective writing; Accessibility; Digital inclusion; People with special education needs

1. Introduction

Digital technology promises to bring about a radical transformation of life in the community, enabling voices in the plural to be heard, by driving collective expression which is a key condition for the construction of a society with full participation and equal opportunity for all its social elements. By way of digital technologies, individuals who were previously culturally marginalized are now closer to their potential and are attaining visibility, which effectively sets off the process of digital inclusion for all.

Thus, the number of persons with special needs (PSNs) is growing worldwide and they claim their legitimate right of access to information/training as well as to the spaces accessible through digital technology. The acknowledgement of the
wide diversity of humankind highlights the need for digital environments and tools fitting the special needs of each individual.

In spite of the growing number of initiatives seeking to expand digital inclusion for all citizens, this process is still occurring at a very slow rate, especially concerning spaces and environments accessible to PSNs. In this regard, it is fundamental that the developers of information and communication technologies (ICTs) consider the issues that involve the concept of accessibility.

The present study intends to outline a project for the development of a tool that aims to tackle the lack of technological options available for the construction of collective or individual multimedia documents. This tool aims to enable the interaction of PSNs, making way for the establishment of cooperation/collaboration groups in the writing process. What is sought, through the use of the Multimedia Workshop\textsuperscript{1} within the context of the Learning Management System (LMS) Eduquito\textsuperscript{2}, is a space for a textual production aiming for the socio-cognitive development of these individuals, as well as their digital and social inclusion.

2. Review of concepts

Much has been researched and developed currently in the field of collective writing mediated by the use of computers. In this process, in which individuals work collectively with the aim of developing a sole document, the group would need to negotiate differences, check sources and refine concepts, thereby shifting the focus from concern with the name of the author credited to care about the information and the communal text (Primo and Recuero, 2003, p. 61).

Sapsomboon (1997, apud Axt and Martins, 2004, p.43), emphasizes the complexity involved in the process of authorship, in which, beyond the elaboration of a text to express ideas, the process includes activities such as: gathering of data, elaboration of intentions and planning and review of goals. In the work done collectively “[...] the complexities, of both the authorship itself and the coordination of the teamwork effort, are presented” (p.43). Working in a group provides its members: “the opportunity for reflection on the opinions of others in contrast to their own, better expression of their thoughts so as to be understood by everyone, work under the acceptance of criticism, mutual respect, reciprocity” (p.44).

Given the context of collective authorship mediated by computer and analyzing the interaction of the individuals in the construction of materials (hypertext), the

\textsuperscript{1} This tool has been developed by Jean Felipe Cheiran with financial support of CNPq - Conselho Nacional de Desenvolvimento Científico e Tecnológico (National Counsel of Technological and Scientific Development).

\textsuperscript{2} Accessible on the web at the following site: http://www.niee2.ufrgs.br/~edquito/
two concepts of typology proposed by Primo (Primo and Recuero, 2003) stand out for these documents: the hypertext collage, which is made from a collective writing activity, however requiring the additional work of administering and joining the parts created separately; and the cooperative hypertext, where all the participants share in the creation of a common text, in a relationship they build and in the ongoing creative product itself. We can associate the concepts of collaboration and cooperation, respectively, to these two categories.

For questions of ease of editing, of control of versions, documentation, synchronization of activities and follow up of the creative process, an activity of collective authorship is a strong candidate for IT support (Axt and Martins, 2004, p.45). Along these lines, we could mention as an example some research developed within the Post-Graduate Information Technology in Education Program (PPGIE) at UFRGS (Universidade Federal do Rio Grande do Sul), which sought to implement editors of collective texts. We should point out further examples: the ETC (Editor de Texto Coletivo - Collective Text Editor) (Behar et al., 2006), developed by the Center for Digital Technology applied to Education4 (NUTED); the Equitext (Alonso et al., 2003), developed by students and scholarship holders from PPGIE; and the Eccologos (Axt and Martins, 2004), developed within a Laboratory for Language, Interaction and Cognition Studies5 (LELIC) project.

Besides the tools for the collective construction of texts, this study highlights some proposals that offer space for the creation of stories in comic or in digital book format. Among the tools that fit into this category, we could mention as an example the comic strip editor Hagaquê (Piconi and Tanaka, 2002), developed by the Center for Information Technology Applied to Education6 (NIED) at UNICAMP (Universidade Estadual de Campinas), and the software Fábrica Fantástica (Santarosa et al., 1996), developed by the Center for Information Technology in Special Education7 (NIEE) at UFRGS. The Turma da Mônica8 Comics and Comic Life9 are mentioned here as commercial options.

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3 We have used the definition originally presented by Maçada and Tijiboy (1997), where collaboration promotes a relationship of assistance (mutual or unilateral) in interaction. Regarding cooperation, besides interaction and collaboration being present, there should be common objectives, joint/coordinated activities, assuming respectful relationships without hierarchies, positive attitudes towards living with the differences, as well as a continual process of negotiation.

4 Núcleo de Tecnologia Digital Aplicada a Educação – http://www.nuted.edu.ufrgs.br/

5 Laboratório de Estudos em Linguagem, Educação e Cognição – http://www.lelic.ufrgs.br/

6 Núcleo de Informática Aplicada à Educação – http://www.nied.unicamp.br/

7 Núcleo de Informática na Educação Especial – http://www.niee.ufrgs.br

8 A demo-version of the software can be obtained through the site http://www.monica.com.br/software/quadrinh.htm

9 More detailed information about the software can be found at the manufacturer’s site: http://plasq.com/comiclife/
Despite the growing interest in the development of tools for collective construction of texts or stories, the great majority of these do not show any specific concern with presenting themselves as resources that are accessible for use by PSNs.

The concept of accessibility used in this study contemplates a greater flexibility in relation to the access to information and the interaction of PSNs with digital/virtual environments (Guia, 2000, apud Santarosa et al., 2007). Accessibility is understood as “a means to provide all users with interfaces that respect their special needs and preferences and enable the construction of an empowering project that carries at its core a rupture with the model of society that sets limits, subordinates and excludes groups of men and women from intelligent collectives” (Conforto and Santarosa, 2002, p. 101).

Despite the continuing growth in the ratio of computers per inhabitant – in Brazil there were 150 computers per one thousand inhabitants in the first trimester of 2007 and interannual growth of 18.5% (Everis, 2007) –, note that many people are still left out of this technological expansion. Warschauer (2006) points out that just making computers available to people does not promote inclusion. There is a need to really have them take part in the information society and for them to be able to gain knowledge from this integration through accessible resources.

There is a growing mobilization towards promoting digital inclusion of PSNs, including the initiatives of NGOs\(^\text{10}\) that are focused on these issues as well as the activities of some governmental organizations. In Brazil, we could mention as an example the approval of a December 2004 bill (known as the Accessibility Law), which regulates service that meets the specific needs of persons with disabilities (D.O.U., 2004).

Even with these initiatives, there is much to be done with regards to promoting digital inclusion of PSNs, given that it is rare to find systems that favor learning and that do not present obstacles to their use by PSNs. Regarding this point, Eduquito (Santarosa et al., 2007) stands out as a space for the creation of virtual communities through the development of collaborative projects, and which counts on its tools for interaction and development as well as its accessibility resources.

The LMS Eduquito was created based on the socio-historical theory put forward by Vygotsky, which seeks to investigate how social interaction promotes the development of Higher Mental Functions (HMF)\(^\text{11}\) during the life of an individual (Vygotsky, 1998). According to the author, children grow up immersed

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\(^{10}\) We could highlight, among so many others, the following groups: Grupo Português pelas Iniciativas em Acessibilidade (www.acessibilidade.net), Web Accessibility Initiative (http://www.w3.org/WAI), Núcleo de Informática na Educação Especial – NIEE/UFRGS, Acessibilidade Brasil (http://www.acessobrasil.org.br), Redespecial Brasil (http://www.redespecial.org.br).

\(^{11}\) The HMF, or HMP (Higher Mental Processes), are the characteristics that differentiate humans from the other animals (Vygotsky, 1998).
in an environment of constant interaction with adults and offer the world, at a first stage, answers dominated by natural processes. However, through the constant mediation of adults, more complex mental processes begin to take place. At first, these processes function during the interaction between the children and others, mainly with adults (intrapsychic processes), which serve as mediators of the child’s contact with the world. As the child grows, these processes end up being carried out internally by the children. Thus, the mediating answers to the world are transformed into an intrapsychic process (Vygotsky et al., 2006, p. 27). Vygotsky gives this process of appropriation the term internalization, and also points out, as a part of this same process, there is a reconstruction of operations representative of external activities in such a way as to occur internally (Vygotsky, 1998).

Vygotsky (1998) highlights the fundamental role of the instruments of mediation in the development of the HMFs. Through these instruments, the individual can modify the means (physical instruments) or modify himself/herself (symbolic instruments or signs).

3. Multimedia Workshop: an accessible proposal

The authors have sought to develop a new tool for the study of the collective/individual construction of documents to be integrated with Eduquito, which makes way for new implementations, given that this LMS has accessibility as one of its pillars of development. The Eduquito environment features a set of tools (a keyboard of signs, spoken chat, audio help, compatibility with screen reading software, and accessibility resources) which attend to a wide range of user needs. These users might be blind, deaf, malformed, motor impaired or may have mental or cognitive disorders (Santarosa, et al, 2007).

The tool being currently introduced, named Multimedia Workshop (MW), is a resource with an enormous potential to complement this environment and to explore the development of the individuals involved in the learning process, since it enables group work, stimulates creativity and the capacity for abstraction. All of these characteristics are highly important to the development of any individual, yet they play an even more fundamental role for PSNs (Vygotsky, 1997).

If the appropriation/use of the ICTs, especially the tools for collective text writing, and the interaction among individuals (with or without special needs) constitute possibilities for their social and digital inclusion, the construction of alternatives that enable the reduction of obstacles and differences in opportunities for PSNs is justified, seeking to focus not on their deficiencies, but rather on their skills, which can “form the base for the development of their integral capabilities” (Vygotsky et al., 2006, p. 34).

12 The integration of this proposed tool with Edquito will not prevent its integration with other existing LMSs or those under development.
The development of the tool (MW) is being carried out in two stages: a modeling phase and its consequent implementation. Its development is based on a web platform, with the aim of reducing the requirements needed for its use and facilitating its integration with LMSs.

Some necessary features of the system proposed here were identified for the initial modeling phase and are listed below:

**Flexibility:** the tool should allow the user total freedom in the creation of a document, through alterations in its format (story, journal, magazine, comic) or in the use of elements (images, video, audio), personalized or supplied by the tool for the composition of the final result.

**Interactivity:** the tool should offer the possibility of user interaction with the elements and content available from the base of the system.

**Collaboration/cooperation:** the system proposed here should enable the collective creation of multimedia documents, developed by way of interaction among its users.

**Accessibility:** the process of the creation of documents and the results generated through this system should attend to the necessary requirements so that the PSNs manage to have access to them without being at a disadvantage during its use. All of the implementation proposed should follow recommendations concerning accessibility, including those proposed by WAI (W3C), as well as those suggested by research linked to Information Technology in Special Education. At this stage, the participation of the NIEE, which can count on its technical staff specialized in programming and accessibility, has proved to be fundamental. Therefore, the aim is to use the tool to promote integration among people with the most varied needs.

**Expansibility:** the tool should enable its multimedia resource base to continually add on new material, enriching the set of options for the creation of documents.

**Portability:** the tool should provide the possibility that the materials produced with it can be exported to formats such as XML which can be visualized externally (including all the resources that were used in its composition), or that can be exported following some standard for sharing learning objects such as SCORM.

**Reusability:** the system proposed here should be designed so that most of the elements used with it during the production of a document, as well as the final result of that production, can be reused for the development of other documents.

In order to meet the needs that have been surveyed here, a set of resources to be implemented in the proposed system are presented.

**Structure using cells**

The creation of a multimedia document, regardless of the format chosen by the user, will be composed of the joining together of a set of smaller units called cells. The cell should be made up by the distribution of elements in its space (media – texts, images, video, audio) that the user has available for creation. As an example of this concept, we could consider the creation of a document in the comic book...
format, where each frame will be represented by one cell. Each cell is an independent element which can be used as a copy in other documents (reusability) and not just in the document at hand.

**Models of documents**

So that the cells will be available on the space of a page of the document to be created, it is important to have a proposition of models with a distribution of elements that approximate the traditional format of the media chosen. Thus, the structure models proposed for the creation of multimedia documents cover the following formats: journal, magazine, story, poetry, scripts and comics. These models are only meant to serve as a guide for the user. It is important to keep in mind that the user can alter this structure of cell distribution in space as he or she may find convenient (flexibility), even by starting from a page without any structure at all (blank page).

**Media bank**

The media bank is a resource for storing elements (media) to be used by users to put together their documents. The media to be stored could be images, video, audio, text files, presentations, etc.

This resource base can be found in a continual process of enrichment, through the addition of new materials contributed by the users, which augment the tool’s existing media base and serves the expansibility needs of the system.

Upon registering new media, the user has to enter a set of words associated with the resource in question. This type of procedure, known as tagging is quite characteristic of the Web 2.0 (O'Reilly, 2005), and helps in the process of classification and search of this media. This same information can be used to serve the needs of accessibility for the documents produced, since it can be used for the description of the media within the document generated, which can in turn be interpreted and read by screen reader softwares.

**Accessibility resources**

In order to promote interaction by PSNs and avoid their being hampered in using the Multimedia Workshop, this tool offers a set of accessibility resources. One prominent feature among them is the ability to navigate within the production elements by way of the TAB key, which could be used by those who are visually impaired or are hindered in using the mouse by motor problems.

Also to facilitate interaction for this sort of user, this tool features, as a resource option in the creation process, a form for defining the spatial positioning of the elements used, of their size and of the layer where they will be presented in the document to be produced.

Finally, the authors sought to create an interface that used icons to reinforce the idea about the deeds and skills involved in the production process, as well as to allow for a more intuitive navigation among elements, in order to facilitate the interaction by users with cognitive deficiency.

**Exporting**
The exporting resource is essential for allowing the materials produced with a tool to be used externally, serving the portability requirement of the documents produced.

By exporting some work produced, the user can obtain upon exiting the tool, a version of the document that contains all of resources used in its production. This way the document can be accessed under any circumstances, without a need for the document to be in editing mode within the tool nor a need for it to be stored on the server in which the tool was installed.

**Collaborative/cooperative creation**

The tool proposed here should count on resources for the coordination of activities of collaborative and/or cooperative creation of multimedia documents. This tool is at a phase in which the adoption of a policy of interaction control (access for editing) of users with a shared document so that all those who have permission can work jointly is being considered.

Another feature that stands out in the aspect of collaboration/cooperation, is the comments resource provided by the tool, which allows users to log their opinions about the cells produced, about the media listed on the data base or about the production as a whole. In addition, this resource is significant for matters of motivation and social bonding.

It also seems fundamental to offer communication resources so that users can have discussions during the document creation process. This resource should be available in the LMS where the tool is integrated. These discussions could be analyzed together with the results produced, with the aim of verifying the development of the work and individual and/or collective knowledge of the users.

Finally, but not less important in this aspect, it is possible to consult and analyze the history of alterations to the cells or the production as a whole. Thus, it would be possible to follow the evolution of the construction of the document, verifying which individuals contributed and what they did.

**Search of the content**

Another important resource featured in the MW is the ability to consult the documents and cells produced (or in production) within the tool, as well as the elements registered in the Media Bank. The tags (keywords) associated with materials appear as fundamental elements here. The search resource allows the users access to all the production developed with this system and to unlock projects for new productions based on these materials.

Currently the Multimedia Workshop finds itself in a process under construction and integration with the LMS Eduquito, following the principle of agile software development methods (Cockburn, 2000). Figure 1 presents the diagram of preliminary use cases, where the participants and a macro-vision of their possible actions within the tool are shown.
For the next stages of the project, there is planned integration of the tool with the proposed layout and then a validation of its usability and accessibility along with individuals that have special needs. The result should be widely divulged and will serve to suggest possible adjustments for the new version of the MW.

4. Final considerations

It is hoped that the tool proposed here, acting jointly with other Eduquito environment tools, will contribute towards reducing the barriers of interactivity between individuals and technology, and consequently the obstacles present in the interaction among persons mediated by ICTs, establishing itself as one more initiative that promotes the social and digital inclusion of PSNs in activities that stimulate their socio-cognitive development.

Aware that an Information Society can be built on three pillars of exclusion – (1) exclude those who cannot afford suitable technological means; 2) exclude those who, because of age or education, among other things, do not know how to operate ICTs and (3) exclude those who for some deficiency or situation of dependence lack access to technological resources –, we seek to provide free and accessible spaces which can be used in the most diverse contexts (family, educational, professional, etc.) with an aim to the continual reduction of these exclusion pillars, given that these barriers result in human collectives for whom integration into the Information Society is not easy.

Therefore, developing a tool that is accessible for collective/individual textual production will allow the availability of spaces for human diversity – a major feat for the construction of an inclusive society. To make the benefits of this new technology available to all becomes, in the context of the current society, a social and ethical imperative. We aim, in this manner, to advance towards the construction of a society where each individual, regardless of personal characteristics, has the same opportunities for growing and living as his/her peers.
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