

eXe (e-learning HTML editor), a Powerful Cognitive Tool for Teaching and Learning

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Abstract. *The eXe project is developing a freely available Open Source authoring application. It is a cognitive tool to assist teachers in the design and development of web based training modules, without the need to be proficient in HTML or XML markup language. The application has the capacity to export content in several formats and so gives the opportunity to be reused and extended depending on the emerging needs of the trainees. The target of eXe software is to provide a user-friendly tool, allowing through developing activities the publication of professional websites for education.*

Keywords. Authoring tools, eXe, Learning object, Teaching and learning

1. Introduction

The Educational Software (ES) in current forms of teaching and learning is associated with Multimedia, Hypermedia, Internet, and is providing management capabilities for multiple channels of communication with the user. These tools provide the advantages of easily accessible environments to users that have not acquired skills to use advanced software tools and so be able to create educational content with acceptable quality and functionality, focusing their interest at the educational part of the project. In this study is presented a user-friendly

application the eXe project.

2. Cognitive Tools

When we talk about Computer Supported Learning we primarily mean the enhancements we should offer to students, making them capable to acquire knowledge, develop skills and be able to cope with the ever changing and constantly increasing demands of the modern world [1]. The applications that extend and amplify the cognitive skills of students, hence cognitive tools, are used either in a context of particular courses or crossing between different subject matters of the curriculum. According to Jonassen & Carr [2] “the cognitive tools are the computer-based learning environments that are designed to facilitate critical thinking and learning”, while Derry [3] suggests that “cognitive tools are the tools that support, guide, and extent the thinking processes of students”. Other researchers [4] suggest that cognitive tools engage and facilitate the cognitive process, and Pea [5] refers to them as intellectual partners that reorganize the way students think.

3. Categories of ICT applications

Applications of ICT in teaching and learning are associated with the prevailing psychological theories of each period, and the corresponding developments in technology [6]. Based on their origin, ICT technologies are divided in: a)

Specially designed software for education, in brief 'Educational Software' and b) general purpose software, such as text editors, image editing software, etc.

Especially ES in simple forms of multimedia has a little difference from one electronic book. It presents a book in digital form enriched with sound, pictures and video. However current applications of multimedia are systems that enable the user to interact with them, providing the possibility to intervene with the application while still in progress, which are based on the available options.

An important subcategory of this category of tools is the authorware or courseware tools, which enable the user to create content under of multimedia or hypertext environments. Those tools are based on different work models; depending on their supporting base they are divided into a) page oriented, b) icon oriented, c) time line oriented, d) object oriented and e) free writing tools, while they are still flexible with the way the material is distributed over the internet. The early, specialized authoring tools that required a strong knowledge base and use of programming languages gave their way to less demanding applications, as the evolution of the technology provided new possibilities for tool development by exploiting the internet and the hypertext editors.

Within this framework we refer to specially designed software to support design and development of learning courses and generally of learning material with ready to use structures and easy adaptation with different content, depending on displayed needs. One of the advantages of these tools is that they provide easily accessible applications to users that have acquired poor skills to use advanced software tools. Consequently they will be able to create educational content with acceptable quality and functionality [7], focusing their interest at the educational part of the project.

Furthermore, there have also been developed applications that provide various publishing options for the output material, such as uploading on a website, creating an independent executable application and the creation of a standard package for describing pieces of information and their metadata, such as the *Sharable Content Object Reference Model* (SCORM) or the *Instructional Management Standards* (IMS) [11].

In this way the generated material can be used in the class or published on the internet, or even be put to any Learning Management System

(LMS) that supports this standard. This category includes Lectora by Trivantis, Captivate by Adobe, Toolbook by SumTotal, the free CourseLab. The eXe (**e**Learning **X**HTML editor) [13] software is included in the category of free authoring, publishing, learning content's material and assessment tools.

4. Presentation of eXe software

eXe is a freely available open source application. It is an authoring and publishing tool for digital content on the internet. One of the major design features of the application is the ability to work off-line, thus no internet connectivity is required to create learning content for the web without having to be connected at that time [13].

From 2008 onwards is part of Open Educational Resources (OER), a term adopted by UNESCO's "Forum on the Impact of Open Courseware for Higher Education in Developing Countries" in 2002. Also it was named a finalist in the New Zealand round of the IMS Global Learning Impact Award 2008. Is currently supported by CORE-Education, a not for profit educational research and development organization. Initially, it grew out of the Tertiary Education Commission's eCollaboration Fund and was led by New Zealand's University of Auckland and the Tairāwhiti Polytechnic. The application is supported as well by an international user community [13], translated in more than twenty languages, and is accompanied with strong documentation and help.

eXe is available for Windows, Mac and Linux. There is also a handy version of eXe for Windows called **ready2run** which runs entirely from a USB flash disk and does not require to be installed. This could prove very useful if you are away from your normal computer or if you wish to evaluate eXe without installing anything. Home page has full instructions for downloading and installing on all operating systems. It is released under the GPL license which extends certain freedoms to the end user.

Other closed source applications such as MsOffice and PDF have function compatibility with eXe. In addition, many other open source programs such as OpenOffice, Hot Potatoes for creating material of its individual components, Geogebra for mathematics, Audacity for sound recording and editing, CamStudio for video editing etc are compatible too.

Many content management and learning management systems do not provide an intuitive WYSIWYG environment where authors can see what their content will look like in a browser when published, especially when working offline. eXe's WYSIWYG functionality enables users to see what the content will look like when published online.

Exporting the generated material, in order to cover different educational weight, is possible in various forms such as text files, simple self-contained web pages Menu driven or single page, iPod notes, SCORM 1.2, IMS Common Cartridge or IMS content packages.

5. Learning Objects

The design of Learning Material (LM) is functioned by one or more training tools to operate effectively in terms of content and the anticipated results for the learner. Regarding the created pages in the environment provided by eXe, it is suggested that educational material has the ability to be designed as Learning Objects (LO), defined as "any digital resource that can be reused to support learning" [8]. The application includes "iDevices" for each small chunk of content. Just one click on an iDevice such as **free text** it will immediately create it in the editor window, as well as just one click on the red cross below it is enough to delete it again, if this iDevice was created by accident. Each page may contain one or more components-iDevices that best fit the learning goal/s. To this end it is proposed to take care and fit one page to screen, because scrolling interrupts the evolution of process. eXe is a plain tool to create learning objects that incorporate a range of elements suitable for teaching and learning activities; simple or more complicated tasks depend on how many clicks needed to complete one task. It is worth noting and useful creating a folder to accept all images and/or sound files you wish to use for creating an LO, as just a storage folder for the working files, not the folder that this learning object will be deployed in.

A completed eXe LO has the ability to be exported in a variety of formats such as webpage or website to suit the learner's needs and utilize of Information Technology. If LO contains some MetaData a fill in on the Properties tab is necessary before exporting the object into a more usable form. Metadata is important in a Virtual Learning Environment (VLE) system which may use the data to allow users to discover your

object. Instead, you can export a complete working website in a ZIP package which can be used outside of a VLE in any web browser to allow your object to be shared, perhaps by those using a stand-alone computer with no internet access. To use the zipped website, one must simply unzip the file to its own folder and launch the index.html file.

6. Standardization of Learning Content

When LO creation follows a set of standards the generated material is considered as standardized. Features such as the SCORM or IMS standards are supported by eXe.

Information included in SCORM standard is based on purpose of creation and all those conditions that may be satisfied, so it might give learning results. At the same time, this kind of information provides a conceptual description of data in a manner comprehensible by machines; it is stored in databases, is searchable and may be retrieved with keywords.

The Instructional Management Standards (IMS) describe the learning goals and the activities for achieving them. The assignment of those activities to the learners and the development process flow, regardless of the platform, since the integrated standards provide instructions for encoding in digital form, transfer and reuse.

In recent years the Dublin Core (DC) [12], an internationally widespread standard developed since 1995, is supported by eXe. The DC aims to develop the minimum set of descriptors of digital objects, to facilitate search engines with the best possible organization of their lists, allowing users with most effectively procedure of search services on the internet or elsewhere as well, with a similar way to a library record. Today DC is the simplest and most widespread general metadata standard. It consists of fifteen metadata elements, designed to be quite simple, yet descriptive enough to be useful in the information retrieval process.

7. Material Designing Process

Once the subject matter we are interested in is defined, taking into account all those discussed above, to construct functional material we need to clearly state the general purpose and analyze the specific objectives during the design phase to implement one or more individual activities for each specific goal. Selected activities for

implementation, namely **what to teach**, are related to the way we choose to approach a particular subject. At the same time **how to teach it**, always depends on the targeted audience, meanwhile **whom to teach**, refers to the age of the participants and the prerequisites. Furthermore, the primary concern is adopting the characteristics of one or more theories of learning to orientate more on the exploratory and collaborative learning [1].

Indicative goals are set for everything each activity seeks to achieve in regard with the learners, such as prior knowledge, conceptual change, ways to assess the requested result, so that there may be room for replacement, if intervention is found to be necessary after the implementation. This approach applies also to the economy of the material designed, because it suggests ways to reduce its size and the required time for development [8].

Most of the **Reusable Learning Objects (RLO)** created under the requirements of the aforementioned standards. These RLO are not by accident part of a larger scale of material making up a module regulated by an educational scenario. In any case, it is possible to use only a part of the already constructed material and at the same time to design a new RLO to fill a particular gap of the original, which was designed either for this purpose or was reused in a new environment and learning context.

During the design phase eXe may support Metadata development, essential elements of the created material such as its description, title, author/s name/s, subject, and others, useful for those searching for related content in content repositories on the internet.

8. Added value of material construction

If the designing and creating of educational material remains a teacher oriented task, the value of the generated material would be minimum to almost nonexistent. As far as the added value is concerned, the constructed objects worth less when there is no trend to replace simple media with digital media, but instead it lays the foundation for creative and collaborative development.

Besides, there are many benefits when in some cases students create material with the eXe software, including those emanating from the possibilities of the software itself and those that result from the evolution of the learning process. In essence not only content remains current with

the review of RLO's created by students, but they also:

- understand better the subject matter
- are encouraged to develop critical thinking
- have better control on the educational process
- are trying new things
- learn from their mistakes
- develop skills beyond those described in the curriculum [9].

In both cases objectives can be approached in different ways to make teaching more exciting and enable learners to discover things for themselves. Especially younger people feel better, if a scenario with open questions might be used. Activities fit well all set of what they will be able to do when they have completed the learning tasks.

9. Interactivity

It is important to recognize that eXe software includes series of components named iDevices for developing effective interactions. It is important keeping focus most on designing the experience and the instruction of learning activities to maintain interest of students, when they are presented with a problem to solve or a scenario and must work to achieve a goal. Some interactions may include team collaboration using a wiki, sharing of information and resources and using RSS readers to receive information that is highly-relevant to the learners. Also they may face some type of challenge, must make decisions, are allowed to explore and to make mistakes without being disciplined [14].

However, it is important to choose the appropriate interactivity level from passive in level I to real-time participation in level IV [15] as described about web based learning. In level I, learners act merely as a receiver of information when they only read text, view graphics and charts or watch a video. The only interaction in this case is simply to move forward by using buttons. In contrast, in higher levels of interaction there are added components with varied responses to cues and complex simulations where actual data entry is required. This rule can help to select and design interactions based on the type of information it is attempting to teach, required and expected skills and attitudes.

As these levels are related to knowledge's type/s like factual, conceptual or procedural and metacognitive consider a suitable sequence of LO activities to fit all these. It depends on the bit of imagination concluded in those actions which best meet learning goals set at the beginning of the session and the know how to use as teaching or assessment item. These activities may require the participants to :

- gather and summarize the main points of a portion of the material
- identify and analyze new concepts, to analyze data , information, tables
- compare two or more views, edit references and composition, to locate problems, to resolve, to propose a plan of action to deal with any situation
- detect errors, incorrect arguments or weaknesses in theories, to prepare studies, expressing personal judgments about how to meet a situation or an issue by proposing better or workarounds for dealing with the troubleshooting
- make documented thoughts on an issue, to refer to the experience of searching for situations where either considers similar to a given situation, or will managed now differently in the light of knowledge and skills acquired
- remember something from the previous text e.g. definition, to formulate a text or compile a summary highlighting the main points

10. Affordances

The eXe program integrates all those features that characterize an authoring tool as cognitive tool to make use of such as searching, presentation, investigation, reasoning and assessment skills, if proper use of its structural elements is done [2]. Also, examples may include both teaching and learning. In second case students develop multimedia material when they conclude a particular course of the curriculum with specific goals and predetermined standards. To this end features are given to apply project i.e. on the school's website; assessment and evaluation of trainees through investigation, to solve a problem or explore a case study. According all these, the material created with the eXe project is potential for:

a) *Designing*: to evolve and adapt to weaknesses and interests of each particular student [10]. Educators are provided with opportunities for creative engagement and fruitful teaching, with large margins of freedom to focus in areas where students need help. Explore data on the internet or in the literature which is related with the concepts that are cognitive barriers for students. It is another way to provide more opportunities to design more flexible and reusable teaching material components.

b) *Publishing*: to be exported in many forms and different environments. Furthermore, the provided prospect for initially creating self-assessment tests and later formative and summative assessment in the form of SCORM, is quite interesting.

c) *Standardization*: measures may be taken so metadata is represented according to the supported Dublin Core (DB) standard [12], the simplest and most widespread general standard. The components of DC are not part of the database structure itself; nevertheless they depict the necessary types of data which are required to describe a material, without defining their structure, their correlations or their relevant restrictions. This possibility provides the designers a simple way to create reusable material and a flexible way for users to search for content.

11. Conclusions and future work

In fact eXe provides the teacher with both a range of activities to choose from and present as a sequence to create a learning session. For example start with objectives and pre-knowledge; followed by reading activities, links to external web pages, articles presented inside the tutorial window and create a case study. Also usage of math-symbols or solving problems and math activities with Geogebra software are available. Opportunities for formative assessment include SCORM quiz, multiple choice, multiple-select, Cloze (fill in the gap).

The idevices are perfectly designed and easy to use. It is possible to build a powerful learning package with sequenced activities, where the learner can move easily from one type of activity to another. Obviously, it is an application to create rich, branched learning material standard compliant and sharable, after a little practise.

We carefully observe all those required features under real teaching conditions, as we

teach different classes and subjects in high school. Field studies are deemed appropriate to test eXe impacts on the attempts of other subjects design.

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