INTERACTIVE LEARNING OBJECT TO ASSIST TRADITIONAL CLASSES AND GET ADVANTAGE OF COMPUTATIONAL POWER AVAILABLE IN PERSONAL COMPUTERS FOR EDUCATION

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Abstract *— The computational power of personal computers available to students now a days can be used for educational proposes. Most digital didactical material provided by educational institutions are passive (non interactive) such as videos, documents, diagrams, presentation and others. Otherwise sophisticated instructional systems/platforms such as Serious Games, Simulators and Intelligent Tutoring Systems required a lot of effort and resources (financial, HR and time) to be build. But it is possible to come up with Interactive Learning Objects to assist traditional classes and provide interactive resources to students with the technology available. This paper presents some thoughts and a proposal (model) to create small interactive instructional systems, which can explore different student's abilities/diversity, a software approach to provide learn-by-doing for students.*

Index Terms — Educational Technologies, Digital Generation, Learning Objects.

INTRODUCTION AND CONCEPTS

The concept of Interactive Learning Object (ILO) presented here is the result of analysis [3] of some computational instructional system technologies: Intelligent Tutoring Systems, Simulation, Learning Objects [15, 13] and Serious Games [17, 18]. Additionally some human aspects about education were analyzed [6] too: Multiple Intelligences (MI) [6, 16], Learning Styles (LS) [16, 4] and de Digital Generation [19, 10].

In order to motivate and usage the interest of the Digital Generation to the digital media [19, 10] for education, it is possible to create interactive programs to assist the traditional education in class, providing experimentation of discipline's content. The student can be an active learner instead of just a spectator or observer, in traditional classes as usual. The ILO can be one of the interactive resources available to provide students the opportunity of "learn-by-doing".

INTERACTIVE LEARNING OBJECTS

There are different definitions for Learning Objects (LO) [9, 13], for the purpose of this paper, we can consider:

- "any entity digital or non-digital that may be used for learning, education or training" [15];
- "any digital resource that can be reused to support learning" [13];
- "A new way of thinking about learning content. Traditionally, content comes in a several hour chunk. Learning Objects are much smaller units of learning, typically ranging from 2 minutes to 15 minutes" [13, 9].

An Interactive Learning Objects (IAO) are a sub set of LO [2, 3], they are active LO where students can interact with. ILO are interactive small applications [2, 3] that can explore theoretical concepts in a practical approach using user interface interactivity and multimedia.

INTERACTIVE LEARNING OBJECTS MODEL

The ILO model proposed here [2, 3] present some concepts and guidelines to create educational applications as follows:

- It could be an interactive resource to demonstrate a theoretical concept (a small computer program, software);
- It should use the processing power available at standard computers and telecommunication;
- The content presentation should be in visual or multimedia way for the experiment (simulation);
- Keep credits and references (books, sites, and so on), as support material;
- It should be distributed by Internet (Intranet or Extranet) and it needs to be available to students any time;
- It should be extensible and updatable, and it could be used as source for new applications. The source code would be available, if appropriate;
- It would be adhere to LO standards, such as SCORM [9] packaging or metadata [9];
- It would be reviewed by a peer-review process, to guarantee quality control;

Moreover there is some inappropriate practice that would be avoided such as:

- Create passive slide presentation;
- Digitalize passive content like photo, graphic, diagram or video;

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- Implement in software the pedagogical methodology;
- To evaluate students;

A small application or software means a computational system developed with a short number line code and in a short time, requiring a small effort to build up and application. There are some languages/platforms that can afford it such as Mathematica [13], Flash [1], Processing [10, 4] or Groovy [6], for example. Those programming languages and environments can be used to create interactive programs for education, as an additional resource to the traditional class. The student can experiment the theoretical discipline concepts in an interactive program.

Standard computers available to students are able to run rich user interfaces; it is possible to dynamically change parameters of small computer simulations and shows results immediately, in a graphical and multimedia visualization.

The ILO can keep credits and references for additional study material such as books, sites, LO and so on.

The Internet is the appropriated media to distribute ILO, the institution can use access control to record users and the ILO usage. Moreover the institution can restrict access according their needs, and to preserve copyrights and software licensing. The internet access even with access control, makes the ILO available to students at any time.

The ILO should be extensible, such as Object Oriented components (programs) can be reused or extended. If appropriate the source code should be available, for easy maintenance.

Standards define for LO should be used such as SCORM or IEEE metadata [15]. The standards can guarantee better interoperability with Learning Management Systems (LMS), as Moodle [8] for example, and coupling among different LO, that can be used together to provide an educational context.

In order to provide high quality applications, each program should be reviewed and approved by subject matter experts (SME). The review can make the ILO able to be used by any institution or professor (tutor) as additional resources for standard classes and to build up educational context with quality control.

The ILO should be a program, an interactive system that uses graphical user interface, multimedia, and 3D visualization that uses the computational processing power available to provide interactivity for theoretical concepts. On another hand it is inappropriate to use passive media such as slide presentation, text, video for example to build up ILO.

The ILO can be used in different contexts, for example, an ILO that explores the "resistance" concept in electronics, can be used in a physics class in high school, or in a technical electronic course (free course) or in a discipline of electric engineering. Facing the usage of ILO in different contexts, it is not appropriate to evaluate the student by the ILO, the student "exam" or "test" should be made by the professor (tutor) at the LMS level, because evaluations can be done differently for the same concept in classes of distinct levels. LMS such as Moodle [8] has sophisticated tools to implement student's evaluation.

The usage of the same ILO in different education context makes it an inappropriate place to implement the pedagogical method by software. Different institutions are free to use a convenient educational methodology, if this methodology is not implemented at the ILO level, it allows the usage of the ILO in distinct scenarios.

FINAL THOUGHTS

There are computers available for students with processing power able to provide rich and interactive multimedia application for education, moreover there are some programming languages that can make the task of create instructional systems easier.

There are some concepts and standards about LO, but there are distinct definitions, more study and standardization is required to provide fully functional interoperability and communication among different LO, ILO, LMS and other systems.

The LO that provide passive content are just a digitalization of traditional didactical material. The ILO can make a better usage of information technology available to provide interesting and engaging experience for the Digital Generation students.

Distinct student's abilities such as MI and LS that are not used in traditional classes [4], it can be archived in education [16] providing interactive and multimedia systems (ILO) as support for traditional classes. It can help students to see theoretical discipline's content in an empirical form, students can learning by their own experience.

More research is needed in the field of instructional systems in order to delineate optimized models to create educational programs that can use the possessing power and telecommunication resources available. The education can get advantage of systems available and the interest of Digital Generation to look for better instructional systems and its integration with LMS and educational contexts.

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