Aplicación de software educativo lúdico y micromundos para facilitar el proceso de enseñanza-aprendizaje

Applying ludic educative software and microworlds to facilitate the teaching-learning process

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Resumen

En la actualidad los procesos educativos se apoyan en gran medida de las tecnologías de la información y la comunicación, algunos recursos informáticos se han ido ajustando a las necesidades educativas, entre las cuales destacan el uso de juegos de computadora, dando origen al aprendizaje basado en juegos (*Game based Learning*), en donde se explora nuevas formas de enseñanza asistida por computadora mediante la tecnología de los videojuegos. En este documento se presenta una investigación acerca del uso de software educativo tipo lúdico en la práctica docente, así como su aplicación en las diferentes disciplinas (matemáticas, biología, idiomas, etc.), de esta manera se presenta al alumno una forma de estudio de temas variados mediante el entretenimiento, al mismo tiempo brinda al profesor un panorama de opciones sobre que herramientas puede utilizarse para facilitar el proceso de enseñanza-aprendizaje.

Palabras clave: micromundos, aprendizaje basado en juegos, software educativo.

Abstract

Currently educational processes are largely supported information and communication technologies, some computer resources have gone to educational needs, including the use of computer games, giving rise to the games-based learning (Game based Learning), where we explore new ways of teaching assisted by computer using video game technology. This document presents an investigation about the use of educational software type leisure in teaching practice, as well as its application in different disciplines (mathematics, biology, languages, etc.), in this way arises the student a form of study of varied subjects through entertainment, at the same time provides an overview of options on which tools can be used to facilitate the teaching-learning process to the professor.

Key Words: microworlds, Game-Based Learning, educational software.

Introduction

To measure how they are creating and innovating technological tools (computers, mobile devices, among others) students acquire them and use as an instrument for the development of school projects or for the use of computing resources (social networks, chats, forums, wikis, blogs, games, among others).

Currently educational processes largely rely on the Information and Communications Technology (ICT), some computer resources have been adjusting to the educational needs, among which highlights the use of computer games or video games, itself characterized by its striking, colorful, music and action. The Free Patents Online (FPO) defines a game as "a program created for entertainment in general and based on the interaction between one or more persons and an electronic device that acts as a bridge between the user and the program". The word "video" determines that the program has a great content to be viewed and this depends largely on the interest generated towards the person that uses it (Clemencia et al., 2011).

Due to the characteristics of computer games, these can be exploited to improve the processes of teaching and learning, since they can be used as tools that support the different methods applied by teachers, making these processes more playful and friendly, thus stimulates the creativity, imagination and self-study for both the teacher and the student. Clemencia et al. (2011) mentions that the pedagogical theories have created many ways to improve teaching-learning, including computer technologies that allow to create new recreational learning environments for students and teachers.

This paper analyzes the use of mainly educational software playful type and microworlds are presented to facilitate the teaching-learning process, as well the importance of this type of system allows students to build their learning through interactive participation, exploratory yet entertaining. At the same time the teacher is provided with a tool that combined his teaching methodology can be supportive to teach subjects in their classes.

Educational Software

Educational software (SE), also called educational or instructional programs are computer programs that have been specifically created as a teaching tool, these systems have been organized from the knowledge of cognitive psychology and constructivist, incorporating techniques from the field of Systems Experts and Artificial Intelligence. This type of software has different characteristics, despite having some basic building blocks and a common overall structure. Some are presented as a laboratory or a library, other basically play a typewriter or calculator style instrumental function, others are presented as a game and others like book.

According Galvis (1993) SE supports the teaching of topics that require learning procedural information, develop intellectual skills and solve problems.

Galvis (1993) and Gonzalez (2004) mention that to select or design an SE is necessary to identify those problems and educational needs where the contribution computer advantages in terms of training and technical and other means that are complex to satisfy.

Thus, it is necessary to identify the type and function made within the teaching-learning process, according to the characteristics that these may have can be found the following:

• *Consultation: Contains information on general topics, such as geographical and biological atlas atlas.*

• *Tutorials: transmit knowledge to students through screens that allow you to learn at their own pace, taking back option on each item as often as desired.*

• *Workout: Allow the student to reinforce knowledge acquired previously, taking control of the errors and taking a positive feedback. They propose different types of exercises such as "complete", "unite with arrows", "multiple choice" among others.*

• *Simulation: simulate events and / or processes in an interactive environment, allowing the user to modify parameters and see how the system reacts to the change.*

• *Playful: Proposal through an interactive play environment, learning, earning points for each user achievement or mistake. Create a database with the scores to form an "honor roll".*

• *Micromundos: Environment where the user explores alternative, you can test hypotheses and find out true facts.*

With respect to functionality, it depends on the way in which the teacher uses the SE and the educational need to be satisfying (Table 1). Having the function provides a range of educational opportunities for experimentation and educational innovation to the process.

Table 1. Functions of educational software.

Función	Descripción	Ejemplos de Software
Informative	Through its activities have contents that provide information structuring reality students.	Tutorials, Simulators, Databases.
Instructive	Direct the activities of the students based on their answers and progress, to comply with educational objectives.	Tutorials.
Motivator	They include elements to capture the students' attention, keep their interest and, where necessary, concentration on the most important aspects of the activities.	All programs
Evaluation	Allows to respond immediately to the responses and actions of students, it makes them particularly suitable for assessing the work to be done with them.	Programs that include an evaluation module
Researcher	They offer students research environments: search for particular information, change the values of the variables of a system, etc.	Databases, simulators, software developers and tools.
Expressive	In addition, they can provide teachers and students useful instruments for the development of research that was mainly carried out outside computers.	Word processors, graphic editors, programming languages.
Metalinguistic	They are means to represent knowledge and forms of communication.	Operating Systems MS / DOS, Windows, programming languages.
Lúdica	Support in learning their own languages Computer.	Educational games.
Innovative	Allows educational activities through entertainment.	Several.

There is a boom in the use of ICT in education, several authors recognize the importance of educational software as a mechanism to support the educational function, with the advancement of technology the SE has become an open learning environment more

interactivity, incorporating multimedia, artificial intelligence components, among others. Such is the case of learning management systems, video games, interactive tutorials, trainers and simulators.

Also it supports the teaching-learning process by providing two types of experiences:

1. Play accumulated knowledge and thought patterns related to the direct transmission of knowledge.

2. To promote discovery learning and creating own thought patterns.

For this work it is of interest to try the experience described in the second point so in the following sections of the playful application software and micro worlds in the teaching-learning process will be described.

Recreational software in the teaching-learning process.
The Information Technology and Communications have collaborated with today's society to facilitate some processes found in environments: work, health, recreation, administrative procedures, access to information, among others. The area of education has not been the exception, because it has opened up huge possibilities for the teaching-learning approach in different ways.

Among the different types of SE above, emphasis on using playful as an option for teaching and learning, as it is an alternative that can be used by educators ago. Some multimedia applications offer a panorama of choices for the teacher, because the issues are not handled in a traditional way but more dynamic and requires more concentration by the student, something he has naturally to be found in the study one way of fun.

This is not a new method of teaching, as some teachers have used traditional games and songs to learn certain subjects and certain age, only now computers, game consoles, software and special hardware is used, among others. In some cases it is through video games as learning is built.

There is a research field where video games and education called Learning Based Games (Game based Learning), where it is exploring new forms of computer-assisted instruction that opens the technology of video games (Casasola, 2008 are involved).

A game is defined as a computing environment on a screen play a game whose rules have been previously scheduled. Another definition is that proposed by Marques (2001) indicates that video games are interactive electronic games that offer a variety of recreational activities whose point of support is a common ICT platform.

Marquis (2001) and Gonzalez (2004) agree that video games based its appeal on the approach to challenges that require observe and analyze the environment of the game, the player must keep information, for inductive and deductive reasoning, build and implement strategies so organized to address problematic situations that are happening according to the script of the game. For its immersive nature, video games make the player engages in the question history and is forced to make decisions that will develop the flow of events of the game. The computer allows learners to explore and interact player in controlled environments or microworlds called playful immersive worlds (Galvis, 1993), can be played by these useful in strengthening certain knowledge and skills (De Freitas, 2010) experiences.

Casasola (2008) supports the use of video games has been incorporated as a habit of large groups of people in various ages and nationalities. Assuming this premise there is a willingness by the use of video games in much of society, especially those incorporating simulation, adventure 3D environments with realistic graphics, or those that challenge knowledge through questions and answers particular issues.

According to Prensky (2006) and Casasola (2008) some of the benefits of educational games are:

- • Allow reinforce knowledge or skill in an entertaining way.
- • Are virtual environments where students complete tasks in simulated environments, by focusing on solving problems or challenges.
- • Contribute to increase motivation.
- • Dan opportunity to verify the skills of students in a risk-free environment.
- • Allows strengthen various subjects related to knowledge, it stimulates the inductive and deductive reasoning, and exercise in the use of the computer.

Izturiz et al. (2007) assume that technological and educational contributions present in the instructional games give the lessons learned greater force and opportunity, indicate that

educational games and simulations raise the motivation of the participant, involving the student with the playful activity which to diversify the means of learning and help to addressing complex issues.

Some activities and techniques used in systems using game-based learning describing Guerrero (2008) are:

- *Practice and feedback. It's easy, using computers, offer a number of problems and know statistics how to solve them, to give feedback to the user. Examples: use of musical instruments, anatomy, physical skills (typing on the keyboard), some aspects of language. Situations where it is necessary to repeat things to learn.*

- *Learning by doing. Explore, discover and solve problems. Ideal for situations that require active participation and decision making by the learner.*

- *Learning from mistakes. In this interactive learning technique, a user moves towards its goal to reach a point of failure, and then get some feedback. It's like "trial and error", and is a good way to learn.*

- *goal-oriented learning. Some educators make the difference between fact-based learning (learning about something), and goals-based learning (learning to do something).*

- *Learning by discovery and guided discovery. Discovery learning is based on the idea that one learns better if he finds something for himself, how. It can be very frustrating for some people, like those who think linearly.*

- *based learning tasks. Traditional learning systems and processes (how-to).*

- *Learning guided by questions. Try to answer in the best way a question you do not know, force us to think and reason information about the answer. For example: Quiz and trivia games.*

- *Situated learning. It is placed (simulate) the user in the actual context in which you will use the knowledge to be learned. For example: learning English in the United States or England.*

- *Role play. Sometimes they are used as a strategy for interactive training to develop skills like interviewing, communication, sales, etc.*

- *Constructivism. Based on the theories of Piaget. For example: games in which players build worlds.*

- *multisensory learning. The idea is to include multiple senses in learning.*
- *intelligent tutors. Based on expert knowledge, the system gives feedback.*

As noted, game-based learning opens the way to new forms of education, which can support students to achieve significant learning on themes that they cost them hard to understand, also, will be a challenge for teachers to use and exploit these forms of education developing skills that are difficult to achieve by other means.

A particular case of the application of video games in education is the use of micro-worlds, they have been useful in strengthening certain knowledge and skills tools, because of its importance as described below.

Micromundos in the teaching-learning process.

The purpose of the microcosms is to promote the user in finding a solution to a problem proposed, through a certain character will perform movements which will build the solution to the problem (Garcia, 2008)

Microworlds are considered realities represented by a game in order to see what can happen when a person learns, are playful and interactive features, renew virtual learning environments inherit the potential of the media to portray characters and own scenarios context through components such as text, illustration, animation, sound and video (Senge, 1996), (Munévar, 2009).

However, it is necessary to substantiate its design microworlds using a teaching methodology, computer resources and game theory (TJ). For the first two aspects, mathematician and researcher Seymour Papert, a specialist in education and Artificial Intelligence, coined the term "microworld" at the end of the 70. The term refers to any simulation where individuals can "live" experiments, verify strategies and develop a better understanding of the real world that are portrayed in the microworld. In essence, Seymour Papert integrates the teaching-learning process through an environment that simulates the real world, using information technology where the individual can simply understand the concepts that are to raise awareness by building and designing objects software. This way of learning by doing is grounded in what Seymour Papert defined as constructionism. This theory states that "subjects, to be active as they learn, they also build their own knowledge

structures parallel to the construction of objects way. He also claims that the subjects learn better when building objects that interest them personally, while the built objects provide the ability to do more concrete and tangible abstract or theoretical concepts and therefore make them more easily understood. "This theory, based on constructivist theories of Piaget, said that for learning to occur the individual must construct and reconstruct knowledge through action.

Microworlds are tools with a constructivist pedagogical foundation that simulate the real world in a computer, allowing individuals to make decisions, to analyze cases, mistakes and provide solutions to a given problem, all in a secure computing environment that allows experience in different scenarios knowledge. Provide the individual with an attractive and easy to use interface that lets you use some theory models to experiment and learn with them. Such experimentation and results generated cause the formulation and reformulation of their mental models and thus represent an ever closer to the subject matter knowledge.

Computerized educational materials are key, especially the playful, interactive micro worlds, because they allow learners (within contexts that are meaningful to them) live entertaining, exciting and challenging experiences, predominantly under user control, and at the same time to develop skills that are difficult to achieve by other means (Galvis, 1997).

From the experiences is found that the cognitive and affective outcomes, in addition to how the teacher articulated and uses the microworld in the teaching-learning process; that is why the design of the microworld and competencies must include at different levels or chapters, the respective assessments and specific powers (proactive, argumentative and interpretive) to be obtained at the end of each.

Speaking of microworlds is the advantage of the new culture of students today who have grown up with new elements both technology and information and communication, which facilitate new educational models, the arrangement is very important to have the teachers to take on these new technological changes, as students have a great willingness to work with all these new technological elements.

Some areas suggested by Barbosa (2006) that must be considered before implementing a microworld are:

- Students will learn to explore yet should create new knowledge.

- Allow creativity, problem solving ability and critical thinking.

- Increase the capacity for problem solving.

- Develop critical thinking.

- Support learning should be student-centered.

- Must have specific educational objectives for each unit or module that integrates the microworld.

- You must have learning strategies that facilitate the acquisition of new knowledge.

- You must generate a discipline for self-learning.

- Must contain specific to each of the units or modules that integrate the tool educational objectives.

- You must provide that the powers of the unit and equally around the microworld are acquired.

- In addition to the above the author to design strategies according to the theme to be developed, as for example is not the same strategies for data structure that strategies for project management.

A good educational material computer (MEC) stirs emotions and interest in solving problems given a series of situations that arise through challenges, puzzles, among others, that capture the user's attention, where through ingenuity, creativity and reasoning their skills, as well as thinking and acting skills are developed.

According to its characteristics, microworlds can be classified into: extrinsic or intrinsic, syntonic syntonic or not (Figure 1).

- *Intrinsic. Arising from the information provided by teachers because they know well the problem, your students and the contexts in which these operate. Besides knowing the content, some have devised creative ways, recreational activities or cases to get their students interested and actively engaged in the search or the consolidation of the knowledge.*

- *Extrinsic. The implementation of these worlds do not necessarily take into account what is learned, however, they serve to awaken motivation but do not guarantee it is maintained.*

- *Syntonic. No need to learn to use the microworld. The student is attuned to the plot, characters and tools.*
- *No syntonic. Others require the learner readiness, in terms of understanding the argument and how to use the tools that are available to act.*

Figure 1. Properties microworlds.

In a microworld is the student who drives the action, depending on the events he running behaviors trigger inside. The theme to develop in this microworld should be relevant to the student, and the objectives to be met. No easy task generate relevant microworlds and some designers are limited to frame the learning process in a competitive argument and trite as the "hangman" (do not be hanging) or the "Hall of Fame" (you have to enter it). These are extrinsic micro-worlds, have nothing to do directly with what you learn, but they serve to awaken extrinsic motivation, but do not guarantee that motivation is maintained.

Studies conducted in various centers of excellence in production of MECs reviewed by Galvis (1997) show that the intrinsic microworlds only arise from those who know the problem, your students and the contexts in which these operate. Thus, it is vital that the generation of the arguments that will serve as background to the action arises from teachers, since they know the issues that students must learn, as well as creative, recreational activities or cases, to ensure that their students interested and actively engaged in the search or the consolidation of the knowledge.

To ensure that the software is accepted by students is necessary to develop a solid argument based thought in their environment, their likes and generally in everything that is part of their daily lives. Thus, the software may be effective in terms of improvement of a solution or learning disability. It is also essential to include a wide variety of challenges (to resolve situations or tools to solve them).

An interesting business case to meet to comply with these characteristics is "TIM" (The Incredible Machine), where a variety of physical microworlds to frame the interaction, within an integrated microcosm of playfulness.

Another example is "The great city" where a database of playful riddles behind the integrator microworld and allows the user is often challenged by the system with artistic literary situations, mathematics or require thinking, finding relationships, trace and check / reject hypotheses; Moreover, integrators and e-businesses Ludomática microworlds in giving access to other microcosms that present exciting challenges for users, designed to spark creative, collaborative and fun learning processes.

Within the story a number of challenges the user must face and resolve, which are the foundation of software on them since they are theoretically represented the learning content should be established. Therefore, it is very important to establish significant challenges to that through these students more easily understand the concepts raised. In the next section some applications in education that have microworlds is provided.

Playful educational software applications and micro worlds in different disciplines.

Biology, Languages, Computers, Chemical, among others: Some applications that have educational software playful and microworlds in disciplines as puntualizarán.

Biology.

Mateluna (2011) designed an interactive software which includes various strategies to stimulate learning a biology unit for freshmen of Secondary Education (EM). Plans and curricula freshman EM Digestion Unit was selected. The development of software considered:

1. An educational design based on an interactive multimedia technology, which allows to focus on content and minimize the visual impact of excessive objects.

2. Instances of self-evaluation, which students can assess their learning process.

3. Instances of playful character linking the fun with learning

The software is structured in units, each associated with an organ of the digestive system, each unit contains an overview of organ and histological structure related aspects of normal operation. audiovisual material to carry forward some content, and self-assessment tools and fun activities that will strengthen learning is included. This educational software known for being friendly, user friendly and attractive atmosphere for teenage students.

Villegas (2011) shows an educational software on the segmentation process in animals to promote creative learning students in the Comparative Embryology course, Pedagogical University Experimental Libertador in Barquisimeto, the system represents an educational resource that will allow capacity building creative, to promote enthusiasm and a stimulating learning, cognitive-emotional impact.

Languages

Ordoñez (2006) designed and implemented a technological and interactive tool capable of handling a self-teaching English language in children of 5-10 years, which allows students to adapt and become familiar with new developments in science and technology. This tool is provided with a reference to the study and learning of English interactive visual interface, plus a suitable electronic keyboard to the needs of the visual interface.

Alderete et al., (2012) describes the features of a prototype educational software, developed for the subject "Language" from the fifth grade of elementary school.

Computers.

It has been found that college students have difficulty learning algorithms, as well as weaknesses in the development of algorithmic thinking, limitations on the ability of abstraction, limited use of appropriate educational software and limitations to access computer labs, reason whereby Cisneros (2010) proposed an educational game to enhance the knowledge taught in the course "Introduction to Programming".

Mathematics

Guillen et al., (2011) presents a microworld that supports the teaching-learning variations and permutations. This software aims to encourage students in the study of mathematics in a dynamic and creative environment.

This medium allows experience, fill gaps in the mathematical background of the student, develop intuition, conjecture, test, demonstrate and see mathematical situations in a practical way. It begins by teaching basic math to the most complicated that are variations and permutations.

Valdes (2011) presents a Computerized Educational material basic integer operations, MEC is based on the algorithmic approach that seeks the student assimilate the most of the courses offered by the Faculty and its development, life cycle methodology it followed of an information system analysis, design, development and implementation.

Chemistry.

Bermudez et al., (2011) proposes an instructional multimedia inorganic chemical materials, research was focused on finding strategies for improving learning of Inorganic Chemistry of tenth graders, due to the difficulties involved teachers and students in the teaching and learning of that subject. This tool can be adapted for distance learning.

In the validation of multimedia teaching materials of inorganic chemistry, it found that a significant percentage of students responded that the material was nice, good, funny, own learning and enables the clarification of doubts.

Ballesteros et al. (2009) MEC has developed an ion exchange resin which is a technological tool that supports teaching and learning process for one of the topics covered in the area of unit operations, so that teachers can implement in methodology of the subject.

Health.

Garcia (2008) shows an educational interactive game that allows children aged 8 to 12 years to meet reliable, complete and accurate information on dengue. The information shows me with this software is to guide the child on how dengue is transmitted, how it is controlled, how to prevent, among others, in order that they may carry this message and to

permanently participate because a lot of people are risk area and may be unaware of the problem.

Other.

Munévar (2009) presents microcosms built for teaching different curriculum areas (mathematics, biology, philosophy, systems and data) in a rural school for children. During the tour the functionality of various multimedia components such as text, images, animations, dialogues, games and videos is integrated.

Diaz et al., (2003) develops a prototype of educational software for children aged 8-10 years, to be used on the Internet, with the theme "Let us preserve our wildlife," contains texts and exercises on the theme of endangered animals extinction. This work collaborates with the use of technology in education, where students learn concepts, practice reading comprehension, seek information and work together. The software development methodology involved the study of various aspects, among which are the instructional design, technical design and evaluation software. An eclectic approach to the use of the methodologies established by each theory studied learning and development in the implementation of the final product is taken.

Figueroa (2009) provides a software tool to assist educators in conducting educational materials that stimulate visual recognition in children and help them grow in the process of learning to read. This tool is playful environments, creative and collaborative learning are shaped by books, games, building blocks, waste materials, thinking games, etc. In these environments the children can live interesting, exciting, funny, surprising, funny, curious and allow the child to develop his creativity experiences also give an order for the ideas to be autocritique in performance, generating changes in mentality and improving processes under its executive responsibility.

Rodriguez and Fog (2006) propose a planned and systematic approach to help treat Environmental Education students and teachers of junior high educational software, through different forms of organization of the educational process. This tool can raise the development of independent skills allowing the user to stay motivated and interactive learning during navigation. It is a didactic material for teachers and consultations needy students to deepen environmental issues.

As it noted there are several applications that have the playful type software in different areas, same as they are addressed in order to facilitate teaching and at the same time to the development of skills and learning, student easier.

Conclusions

The information and communications technology have been adapted to the needs of society, in the same way have been a mechanism to support the educational function by providing tools that are to support teaching and student for building learning.

Educational software supports teaching of topics that require learning procedural information, develop intellectual skills and solve problems, to design them is necessary to identify those problems and educational needs where the computer provides advantages in terms of training and technical viewpoint and that other means are difficult to perform, their functionality depends on the way in which employs the teacher and the educational need to be enforced.

The SE using playful as an option for teaching and learning offer a panorama of choices for the teacher, because the issues are not handled in the traditional way but dynamic, while more concentration by students is required, something he naturally offers to find the fun time study and helps to strengthen their knowledge, skills, increase motivation, stimulate inductive and deductive reasoning, among others.

Computerized educational materials are key, especially the playful, interactive micro worlds, because they allow students to have fun, exciting and challenging experiences under some control and simultaneously develop skills that are difficult to achieve by other means.

There are several software applications ludic and microworlds in areas such as: Biology, Computers, Languages, Health, Mathematics, among others, which aim to facilitate teaching and at the same time make it easier construction of student learning . The teacher plays an important role in the extent that it becomes a counselor in the process and is also the one who should be aware of to connect students to obtain compliance with the objectives, since the risk of runs the student is distracted by technicalities or forget the reason for their educational process.

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