Analyzing the design of Student Play, an educational module of Agent Socialmetric

Antoniet Kuz[1], Roxana Giandini[1,2,3]
[1]GIDAS, Universidad Tecnológica Nacional, Facultad Regional La Plata, La Plata, Buenos Aires, Argentina.
akuz@frlp.utn.edu.ar
[2] LIFIA, Facultad de Informática, Universidad Nacional de La Plata. La Plata, Buenos Aires, Argentina.
giandini@info.unlp.edu.ar
[3]CIC, Comisión de Investigación Científica y Tecnologica, La Plata, Buenos Aires, Argentina

Abstract. Currently, the incorporation of Information and Communication Technologies (ICT) into the educational process allows seeing the same from different dimensions. The educational software as an instructional support integrates the contents from a didactic and adapted to the teaching as a fundamental part in the environment of the society of the knowledge and the information. Seeking to deepen the relationship between teachers and students in the courtly context, we have developed a web tool called Agent SocialMetric based on two research areas, social networks and interface conversational agents. Integrating to Agent SocialMetric we extends the tool with a module called Student Play which is responsible for establishing interactive games for students to educate in values, through various interface conversational software agents. In the present research we present the tool and analyzing design considerations that we have taken into account. Finally, we will present the conclusions related to this compilation work.

Keywords: Design, Educational Software, Agent SocialMetric, Student Play

1 Introduction

Educational software technology is *"the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources"[13]*. Educational software comes in several types. Educational software is more intended to educate kids and is easy to use adapted to the different age ranges. The most accepted educational software is normally known as edutainment, meaning it is a game in which users play and learn at the same time. Children in the world play, and this activity is so preponderant in its existence that it is said to be the raison d'être of childhood. Indeed, the game is vital; conditions of a harmonious development of the body, intelligence and affectivity, so the child who does not play is a sick child, body and spirit [2]. The war, the misery, by leaving the individual delivered only to the worry of survival, doing with it difficult or even impossible to play, make it wilt the personality.

As part of developing educational software, design has becoming an important research area, and is significant consider that exists a certain a number of dimensions that are particularly prone to lead to misunderstandings when considering educational design issues. Design of educational software may correspond to very different realities. As a consequence, many notions or issues may be addressed in different ways according to perspectives or matters of concern [16]. Software design is the process of defining the architecture, components, interfaces and other characteristics of a system. Centered on the latter we combine a thorough understanding of the function of a educative software with a thorough understanding of the needs of the user. In our research we show differently, aspects of interactions that appear to impact learners' perception of the educational software, and seen as part of a broader field of knowledge known as software ergonomics [12].

In our case we present a case study through a module Student Play of a tool Agent SocialMetric. The heart of our tool and his modules was developing in stage process which involves different activities and stages like learn, that involves understand and clearly define a problem, after defines imagine stage, by the end of the imagine stage a solution has been identified, and the make stage uses prototyping and testing to refine that solution [1]. Through the research process we studied as a part of design educational software, when the software is the more attractive and effective means facilitating the teaching and learning processes [3]. Trying to work on this need in this our research we show Student Play a software for develop emotional and social skills for preschoolers. The software is a tool for learners seems to depend on its degree of interactivity with the user and the level of complexity.

This paper is organized as follows: In section 2 we introduce the concept of educational software. In section 3 teaching-learning processes and the relation with human computer interaction. Section 4 presents a case study with Agent SocialMetric and in particular Student Play and explains some factors of human interaction. Finally, conclusions and future work are presented in Section 5.

2 Educational Software

The need of new software technologies grows and also facilitates the teaching learning process. At present some software platforms provides the facility and access to parents for a bird's view of the progress of their children in the classroom. More and more educational software online are coming up to help fill a need for more personalized, interactive educational experiences for students and teachers alike.

Educational software is also known as an educational or didactic program are all those computer programs created with the specific purpose of being used as a didactic means, that is, to facilitate the teaching and learning processes. This type of software integrates multimedia content and provides users a high interactivity level. The two features distinguish them from traditional teaching practices. Multimedia content, such as graphics, pictures, and sound helps engage students in their lessons and in the teaching-learning process. For instance, when it comes to learning history, students could go back and see videos or other online-based content related to it. Furthermore, online education software benefits teachers, allowing them to better connect with the

students and help them keep students interested in a lesson and also promotes a productive learning environment.

As part of educational software, games provide new way to explore reality and different strategies to work on it. It benefits students because we live in a society that is based on rules. In addition games enable learners to develop their imagination, think of numerous alternatives to a problem, discover different modes and styles of thinking, and encourage behavior change in addition to promoting group exchange. At present, pedagogues consider games as a fundamental tool for the teaching-learning process, to raise the independent work of students and to solve problematic situations in practical activity. A game is defined as the activity performed by one or more players, using their imagination or tools to create a situation with a certain number of rules, in order to provide entertainment or fun [17].

Educational games can be define as game technology for learning and teaching purposes which includes specific subject intended to meet desired learning results for students. Besides that, educational games have also opened a new door of learning with fun and excitement. Studies on educational games shows that the fun factor of a game inspire students to believe that they will learn better, at the same time they are captivated with educational games idea itself [7]

3 Reviewing design educational software

Interactivity is a quality that differentiates it from other means, it should be considered as the main indicator for software use. Human-computer interaction concerns design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them [4]. The use of the TICs and software's in the classroom and in the teaching-learning process implies a greater degree of interactions, and abstraction of actions, an awareness and anticipation of what is often done "automatically", stimulating the passage of sensory-motor behaviors to the operative behaviors, generalizing the reversibility to all planes of thought.

Through software, the user can interact by textual stimuli, graphics, color, sound, animations; is able to process the information and show the result of what the user requested to do. As we see in the research of Andrew Sears, Julie A. Jacko [14] they consider educational software design must expand the concept of user-centered design (UCD) to one of learned-centered design (LCD). In this process there are several steps that involves analysis and their needs of learners and teachers, select pedagogy, select media/technology, prototype, assessment strategies, usability and design that involves cognitive considerations, interface design. User-centered design incorporates a continuum of research perspectives, according to Hinostroza et al. [6] they assert that in the design, development and evaluation of educational software, this areas converges to demonstrate the need for knowing and considering the context of use of educational software and for understanding users' perspectives about its roles and possibilities and hence supports a perspective on educational software.

As we see in the research of Gennaro Pellone [11] educational software it is meant the computer software program with which learners interact when being taught or

being assessed by a computer, and by design it is meant the flow, the inclusion or omissions of certain key features responsible for the effectiveness of the program.

More recently in Tchounikine [16] research design of educational software consists of imagining, thinking and elaborating and describing a computer-based system with respect to some pedagogical and educational objectives taken into account in relation to setting within which the software will be used.

Centered in our research in the design aspects we considering, desirability, asking us a question do people enjoy using it? Because a computer is predominantly a visual medium and this factor advances a challenge when designing instructional displays. So in study case we show some considerations our design experience, identifying the proper elements in that could help them produce effective educational design. The design is a rough draft of what the final product will be. In this phase the contents that the planning phase determined, which will be developed in the software, are structured, a navigation map is elaborated for the software, which allows to divide in parts, each part will result in a module. The number and size of the modules depends on the length of the contents, and also a set of tasks that include the instructional design, the interface design and the computational design.

Focusing in the design of the interface, it establishes which messages will be used for communication between the user and the software. Also centered in computational design, it specifies the multimedia elements of information capture, digitization, edition, images, video, animation, text, etc. as well as the production of different buttons and backgrounds integrate them and obtain the different screens to use.

4 Study case: Student Play a module of Agent SocialMetric

The educational field cannot be kept out of technological advances at the social level and the new needs of young people born in the information society. In this order of magnitude, numerous possibilities for the empowerment of education materialize through active participation, among which is the one offered by the new technological tendencies. Agent SocialMetric [9] is an open source interactive tool that links and integrates two topics of great interest: intelligent agents and social network modeling. It has a conversational interface agent called Albert, which is a software entity and a program designed to hold a conversation with a person, in our case, the teacher see Figure 1.

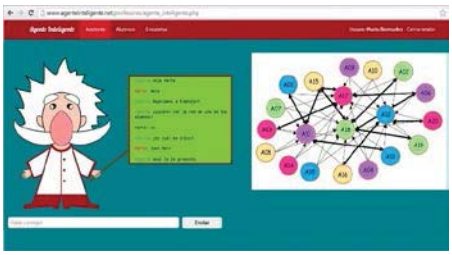

Fig. 1. Interface of a tool Agent SocialMetric

Agent SocialMetric tool has been expanded with the Student Play module which is in charge of establishing with the preschoolers interactive games to educate in values, through various conversational software agents, shown in Figure 3. We trying to incorporate the student in the interaction with the tool, we have developed a module called Student Play [8], in Figure 2 we show the model integrating Student play to Agent Socialmetric.

Student Play is software through which children acquire, in a playful way, basic knowledge about emotions: what they are, how they work and how they can be controlled. Provide strategies to identify emotions and the child understands the relationships between emotions and the situations in which they occur. Train in skills to express the feelings and needs associated with them. It seeks to provide guidelines to accept positive and negative emotional states and provide control techniques to regulate emotions without overdoing or avoiding them. An adequate management of emotions also promotes the development of good social skills, a reinforcement of self-esteem and a better capacity to face and solve problems that life may pose.

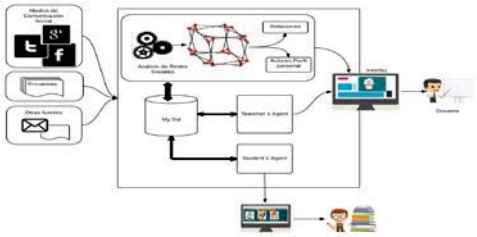

Fig. 2. Agent SocialMetric and Student Play

Fig. 3. Interface of Student Play

However, to develop a quality computerized educational material, in this case educational software, it is necessary to take into account the aspects considered important for its development, from several approaches like its environment, treatment and development methodology. On one hand from its environment we must consider the target population, area of knowledge, educational need, limitations, among others. Also it is necessary for the software to be effective to determine the target population to attend to the variable "age groups", considering the corresponding level of emotional maturity in each age group. In our case will be oriented to the preschool level in particular those that are in 5 years, since at this stage they develop the acquisition of values and principles indispensable for coexistence.

On the other hand centered in the design we consider some aspect as we considered important for HCI, which includes screens design looking that are easier to use for students. The development of this study is driven by the growing need to incorporate visual component in the field of design of educational interfaces. For that reason we taking into account cognitive structural, communicative design, aesthetic and visual criteria [15].

4.1 The interface design

In continuity with the aspects related to the requirements of software, it is interface design needed. The user interface in our project is a combination of its graphic elements and its navigation system. It is important to take care of the design, to ensure interest and ease of access. The user interfaces are those that include elements such as menus, windows, icons, buttons, scrollbars, tasks, displays and all those channels by which communication between the user and the computer is allowed. In our case the interface of software is the part of the application that the user sees and with which it interacts. We in development seek to achieve an intelligent interface that is easy to learn and use, designed specifically for those students who use it adjusting the user instead of having the latter to adjust to the software, as shown in Figure 4.

That is why we have considered the incorporation of interfaces software agents represented by an avatar to start to interact as shown in Figure 5. Interface agents are designed keeping in mind that a child may be attracted to certain objects, the way he perceives them, their shape, their colors, and the emotions it causes. This is why the child can select that personified agent that appeals to him, since affective attention is linked to the appearance of the application. It is based on the emotional bond that is established between the user and the application. In our case students perceives the information from the game, after system select and execute relevant knowledge and execute internal and external actions.

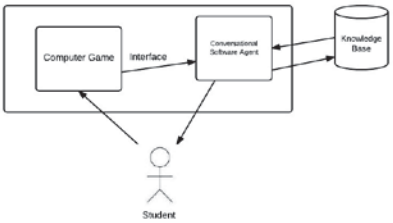

Fig.4. Model of interface design

Fig.5. Screen of selection of an avatar to start to play

4.2 Cognitive design

The subject of cognitive load theory has a number of active [10]. For the most part, cognitive load theory [10] has resided in the context of learning and instructional design and its use in the design of interactive entertainment, its usefulness in such a circumstance. The effective learning of a computer controls, games, interface, and general play should logically have a direct effect on how successfully a user can operate the game. The games embedded in the module are aimed for children in preschool age, while proposing ethical dilemmas that players-students should solve using their own scale of values, empower emotional intelligence.

When designing user interfaces and cognitive skills must be taken into account, perception of users, allow adapt the program to them. One of the most important things of a good interface, is to reduce dependence on users of their own memory, not forcing them to remember things unnecessarily (e.g. information that appeared on a previous screen) or to repeat operations already (e.g example, enter the same data repeatedly).

In our case the user control it is given because the software does not require any pre-requisite in order to perform the tasks, and also by the talks gives by conversational software agent. This means that students are allowed to repeat the tasks as many times as necessary, in any sequence they prefer, giving them control over their own performance regarding the tasks separately. However, learners seem not to have a good control over the great scenario, that is, the software does not provide any kind of record containing scores and other relevant information for students to access in order to have a view of the whole learning process, becoming aware of which contents they are not mastering or what aspects of the tasks they need to improve.

Building embodied conversational agent, we wish helps users and must be able to interact with conversational behaviors that is, it must provide a way of realizing this set of conversational surface behaviors in a principled way. Also in our case agents adapted to the range of age to support conversational learning (see Figure 1), here, the emphasis is on the computer assisting rather than replacing the human teacher through a combination of computer (providing resources, tools and teaching) and human teacher. This involves a chat area, an online facility for learners to communicate at a distance, by typing and responding to messages.

4.3 Aesthetic design

In terms of web design, aesthetic consideration is the simplicity that refers to an approach to express something in a complete yet economic way and consistency. Reflecting on the intention of the system, the designer has to convey the messages to the reader thoroughly and get directly to the heart of the matter. We considered not put too many objects on the screen, and those that exist must be well distributed. Each visual element influences the user not only by himself, but also by its combination with the rest of elements present in the screen.

In order to fully this criterion, the software should allow learners to use the keyboard to replace some functions which are only made by using the mouse, such as

the selection and execution of some actions needed to perform the tasks. The software does not take into account the fact that students may be either experienced or novel computer users. The social experience of game play and the software agent creates the conditions to work on communication skills and personal traits from resilience to empathy, in our case story games and paintings can provide the motivation and engagement that helps students build knowledge and skills within a particular topic values such as friendship, etc.

The images on the screen are not just for decoration; they must help to encapsulate a mass of information. Screen layout should look clean as well. In our case we provides for the user tree types of animated images for the interface of the agent looking through these three options does not distracting and confusing. Just keep the content simple and to the point.

Then consistency means the agreement or harmony of parts or features to one another or a whole. In terms of our design, consistency involves the homogeneous pattern within the page and throughout all the system. The elements in the design are unified to produce a coherent whole. Such coherence ensures that your design will become visually apparent to the readers after their exploration. The background, text format, and color usage should be carefully chosen to produce a consistent screen layout for all our pages.

4.4 Visual criteria through the colors

It is important take into account that elements related to the use of colors in the design of educational software for the early ages [5]. A psycho pedagogical assessment is made, based on the influence of colors on educational software, as a means of teaching that favors the development of general intellectual abilities. It is explained how the achievement of the balance between colors favors an appropriate interaction of the children with the new technologies, as innovative resources and indisputable means for the fulfillment of the objectives in the educational field.

In the early ages, where preschool education can be framed, motivation is a fundamental component for the appropriation of knowledge. The children in these Ages, must acquire intellectual abilities related to the sensorial patterns, among which are the identification, verbalization and recognition of colors and their tonalities. The appropriation of these contents, will serve as a basis in the learning, writing, reading and mathematics. A psycho pedagogical characteristic in these ages is that the children are assimilating gradually the skills and contents for each year of life. The acquisition of knowledge comes through the institutions and the interaction with the adults that the surround. This makes it possible to create the appropriate conditions to promote maximum possible development in each of the children, as an end to Cuban education. To all of the above, as an indispensable element, the game is joined, which becomes a educational and pedagogical activity of vital importance. This favors, that the children of the first ages. Perform tasks, which encourage them to play, work, organize, socialize and learn with children and adults, in order to overcome the achievements of development. These tasks, they need the direction of the educators, as leaders of the process in the field of education.

Effective color choices go beyond just personal preference, because colors have an extraordinary ability to influence mood, emotions, and perceptions [5]; take on cultural and personal meaning; and attract attention, both consciously and subconsciously. The principal challenge is in balancing these complex roles that color plays to create an attractive, effective design. It is for that reason that we determine a set of balance colors, selecting a primary and secondary color palette (see Figure 3). This is due to the excess colors such as red, orange, gray or black, produce great levels of exaltation, fatigue and hyperactivity. This causes little assimilation of the contents proposed by the teaching in the fulfillment of the teaching tasks, since children do not reach the degree of concentration desired. In turn, the indiscriminate use of colors such as blue, green, violet, pink, gray and white in the educational software, propitiates a state of absolute rest and stillness, which favors the dream and exhaustion in children. This is detrimental to the objectives pursued by the software educational, for a favorable cognitive development.

Fig.3. Primary and secondary color palette

5 Conclusion

The design and implementation of educational software call into play two well established domains: software engineering and education. The research is based on showing some design considerations of the Student Play tool. This leads, to an exploration of the resource, in terms of visual design, which in most cases given the communicative features of the software. After identifying the target population, area of knowledge, educational need, limitations and resources for users of educational software and how to guide learning, for the designing educational software.

In this paper we present a set of design considerations of a software module as a computerized educational material or resource taking into account that the children construct their own knowledge through the interactions, thinking to find the balance between your current level of knowledge and the new.

The design of educational materials and resources such as Student Play involves the understanding of many aspects in order to be able to develop tools that effectively support the teaching-learning process. The use of new technologies opens extraordinary tending to improve the teaching-learning process.

As regards future work, we will try the interaction and between Agent SocialMetric and Student Play, emphasizing the design of application “character” (functionality and style) as well as the application’s structure, and expanding the notion of software to encompass the design of cognitive and social strategies.

References

1. *Thinking design with kids*. The Schoolhouse Centre for Progressive Education (2016).
2. K.S. Berger. *Psicología del desarrollo: infancia y adolescencia*. Médica Panamericana (2007).
3. G.G. Bitter and J.M. Legacy. *Using Technology in the Classroom*. Pearson Custom Education Series. Pearson/Allyn and Bacon (2008).
4. Elizabeth F. Churchill, Anne Bowser, and Jennifer Preece. Teaching and Learning Human-computer Interaction: Past, Present, and Future. *interactions*, 20(2):44–53, mar (2013).
5. E. Heller and J.C. Mielke. *Psicología del color: Cómo actúan los colores sobre los sentimientos y la razón*. Gustavo Gili (2015).
6. Enrique Hinostroza, Lucio E Rehbein, Harvey Mellar, and Christina Preston. Developing educational software: a professional tool perspective. *Education and Information Technologies*, 5(2):103–117 (2000).
7. Roslina Ibrahim, Samsudin Wahab, Rasimah Che Mohd Yusoff, Khalili Khalil, INSTEDT Desaru, and Azizah Jaafar. Student perceptions of educational games in higher education: An empirical study. *Issues in Information Systems*, XII(1):120–133 (2011).
8. Antonieta Kuz, Mariana Falco, Francisco Castellini, and Roxana Giandini. Student Play: un Módulo Educativo de Agent SocialMetric. In *4to Congreso Nacional de Ingeniería en Informática/Sistemas de Información (CONAISI)* (2016).
9. Antonieta Kuz, Mariana Falco, and Roxana Giandini. Understanding the teaching-learning environment through Agent SocialMetric. In *Information Systems and Technologies (CISTI), 2016 11th Iberian Conference on*, pages 1–4. IEEE (2016).
10. Fred Paas, Alexander Renkl, and John Sweller. Cognitive load theory and instructional design: Recent developments. *Educational psychologist*, 38(1):1–4 (2003).
11. Gennaro Pellone. Educational software design: A literature review. *Australian Journal of Educational Technology*, 11(1) (1995).
12. Gicele Vergine Vieira Prebianca, Vital Pereira dos Santos Junior, Christiane Fabiola Momm, Leonardo Furtado da Silva, and Hannelore Nehring. O uso de softwares educacionais como ferramentas mediacionais e de inclusao tecnológica. *Pesquisa Brasileira em Ciência da Informaccao e Biblioteconomia*, 9(1) (2014).
13. Rhonda Robinson, Michael Molenda, and Landra Rezabek. Facilitating learning. *Educational technology: A definition with commentary*, pages 15–48 (2008).
14. A. Sears and J.A. Jacko. *Human-Computer Interaction: Designing for Diverse Users and Domains*. Human Factors and Ergonomics. CRC Press (2009).
15. Yen-Ru Shi and Ju-Ling Shih. Game Factors and Game-Based Learning Design Model. *International Journal of Computer Games Technology*, 2015:11 (2015).
16. P. Tchounikine. *Computer Science and Educational Software Design: A Resource for Multidisciplinary Work in Technology Enhanced Learning*. Springer Berlin Heidelberg, (2011).
17. Unesco and Unesco. Education Clearing House. *Educational Studies and Documents*. Number n.29-41 in Educational Studies and Documents. UNESCO (1978).