Persuasive Technologies in Education: Improving Motivation to Read and Write for Children

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Abstract. In this paper we present an example of how principles of motivation can be designed into educational software to support students in achieving their goals. The objective of our software was to develop a reading habit in children between 8 and 11 years of age by motivating them to improve their reading and writing skills. By designing activities that integrate Gardner's Multiple Intelligence theory to our software, we were able to motivate children to read while acknowledging individual differences in their learning process. The results on presenting this software to different groups of children from the city and rural environments show how we were able to motivate students to read through the software itself and the activities it proposes, in a way that was credible and connected to the real-world environment children lived in. Our results show the importance of integrating principles from Persuasion such as similarity, tailoring and credibility, together with theories such as Gardner's in educational software to achieve motivation to read and write in children.

1 Introduction

Nowadays, children in western countries are reading less and less [4]. We are living in an electronic-visual era where children are much keener on browsing the internet, playing computer games and watching television than reading a good book. Books, as a communicational, educational, and entertaining experience cannot be compared to the appealing experience offered by today's technology which captures their senses through visual and audio stimuli and that have become a part of their everyday life. For example, the skills and attitudes fostered by watching television are oriented more strongly towards visual than towards linguistic stimuli [11]. However, the precipitous decline in book reading has also been a drawback to the personal process of developing their imagination. Children watch processed information whereas reading invites you to make an attempt to generate your personal world. With this as a background, we realized the importance and meaning of forming reading habits in children.

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1.1 Motivation to Read

Learning experiences are better when they come as a result of our own interest and will. These experiences are more effective when there is an emotional dimension to them or when needs to discover have been satisfied. If these basic conditions of the learning process are not met, the process usually becomes an obligation and is usually followed by boredom.

Reactions that relate to the learning process are called cognitive reactions. Among these, we can account emotions, values, and personality development. All of these build up an affective dimension. Our interest in something is nothing other than the result of our attitudes and affective experiences. It is possible to create interest for something, given the necessary conditions both in the environment and guidance.

There are many interpretations of the Motivation concept. According to Papalia [7], they are tendencies and intentions that guide individual behavior, the power that activates and drives behavior towards achieving an aim which requires the use of energy, defined objectives, and willingness to use this energy long enough to achieve this aim.

Motivation becomes an important factor when trying to motivate children to read. Children between ages 8 and 11 have very powerful physical and psychological needs for learning new things. However, human beings (and specifically children) do not have the same cognitive strengths and weaknesses [3].

1.2 User Group

We defined our user group to include children between 8 and 11 years old for several reasons. First, this stage of the reading-learning process in children is where they evolve from one-page-a-day readers to more skilful readers. It is a crucial stage in creating reading habits for children. Second, regarding the development stages of children according to Piaget [9], children at this stage are less egocentric and can engage in collaborative work better. Children are better listeners; respect each other more and can argue without fighting, expressing their point of views and reaching agreements (if necessary). Finally, they can focus on a single task without being distracted when this task is interesting to them.

1.3 Objectives

Our main objective was to create a space where children between the ages of 8 and 11 would feel motivated to rehearse and practice the target behavior of reading and writing. To accomplish the objective of developing a reading habit we designed educational software thus reaching children with the visual and audio stimuli they are so familiar with.

2 Conceptual Framework

The main question we were facing was: how do you motivate children to improve their reading and writing skills? In order to motivate children to read we defined a

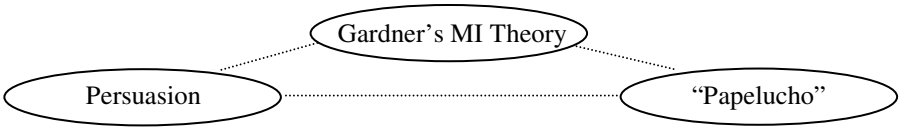

Fig. 1. Conceptual Framework. Our strategy to motivate children to read and write consisting of three main elements: Gardner's Multiple Intelligence theory, principles from Persuasion and a Chilean literary character for children called Papelucho.

conceptual framework that allowed us to address several important aspects. First, Howard Gardner's Multiple Intelligence theory helped us acknowledge individual differences in the learning process of children. Second, principles of motivation and influence were designed into our educational software to support students in achieving their goals. Third, by including a Chilean literary character for children named Papelucho we were able to reach children in a way that was appealing to them on different levels. This conceptual framework is explained in the following sections.

2.1 Theoretical Framework: Gardner's Multiple Intelligences Theory

There is a growing discontent with the classic notion of intelligence and with the current measurements of IQ. Many individuals with a low IQ, later show an outstanding ability for adaptation and great creativity. For example, Pablo Picasso was a very poor student and hardly mastered the basic literacies. How can you explain such a paradox? This example and others motivate the search for a wider conception of intelligence.

Gardner proposes the following definition of intelligence: "The ability to solve problems or to create products that are valued within one or more cultural settings" [3]. So what has been added here? Observe how a creative ingredient has been added to the classical definition of intelligence: the ability to create products. This *constructivist* conception takes into account the fact that students learn in different ways and that many pupils under typical deadlines and exam conditions seem to show poor skills to solve given problems. However, if they are given the time, encouragement, and maybe the space for teamwork, they show a remarkable ability to create products and solutions.

Gardner emphasizes how our mind is split into modules, which can be seen in the rich variety of our abilities and creative domains. We all have different skills, and different people show how skilled they can be in some areas and not in others. His Multiple Intelligences Theory claims the existence of seven separate human intelligences [3]. The first two have typically been valued in school: *linguistic* and *logical-mathematical*. The *linguistic* intelligence is the ability to communicate through language in all its forms while *logical-mathematical* involves the capacity to analyze problems logically, carry out mathematical operations, and investigate issues scientifically. The next three intelligences (*musical*, *bodily-kinesthetic* and *spatial*) are mainly connected with the arts. *Musical* intelligence is the ability to create and give meaning to sounds. *Bodily-kinesthetic* intelligence entails the potential to use one's whole body or part of it to solve problems. *Spatial* intelligence is the potential to

recognize and manipulate the patterns of wide space and of more confined areas. The final two are the personal intelligences: *interpersonal* intelligence is the capacity to understand intentions, motivations and desires of other people (i.e. social skills) and *intrapersonal* intelligence involves the capacity to discern different personal feelings and build one's own working model.

The Seven Multiple Intelligences Theory is a tool available for teachers to make a better teaching-learning process. It is a guide and a set of specific strategies that can be applied for this purpose. When teachers design new activities for their class, they must take into account how their learning styles and intelligences differ among pupils. This means teachers must look, on one hand, for diverse methods of knowledge representation and, on the other hand, design projects that motivate individuals who are particularly strong in one of the seven intelligences. This means teachers should not discourage activities in a specific intelligence for those pupils that rank low at it. Cooperative work in a multi-intelligence environment should be encouraged. We believe that new teaching strategies must consider the different intelligences.

2.2 Persuasion: Captology and Teaching as Persuasion

In the last decade, persuasion has been investigated in two apparently distinct lines of research: *captology* [2], and *teaching as persuasion*. The former is connected to the study of computers as persuasive technologies. The latter is connected on the use of persuasion as a pedagogical approach to teaching [1][5][6] and on creating training products (educational software) that motivate students to acquire new knowledge and skills. However, research in both *captology* and *teaching as persuasion* is founded on a positive view of persuasion. *Captology* is primarily related to the positive, ethical applications of persuasive technologies, focusing on the design, research and analysis of interactive computing products created for the purpose of changing people's attitudes or behaviors (without using coercion or deception) [2]. The *teaching as persuasion* metaphor seeks to change others' behaviors, their understanding judgments, or positions on a given topic by appealing both to reason and emotion [6].

A second important aspect is how the change of behavior is achieved. In *captology*, persuasion implies a voluntary change in behavior or attitude as opposed to coercion, which implies force [2]. The *teaching as persuasion* metaphor recognizes that learning involves more than assimilating new knowledge; it involves the intention to change one's ideas. Thus, the *teaching as persuasion* metaphor puts the onus for change in the hands of the learner, not the teacher. Students voluntarily decide to change their beliefs by juxtaposing individual ideas of students against those new concepts that teachers are trying to convey [10]. The veracity of persuasion depends on the importance of the issue, and the strength or credibility of the arguments, evidence, or examples presented [1]. Therefore, in our software, credibility will be a key issue to motivate children to read and write.

Persuasion and Gardner's Multiple Intelligences Theory. In education, persuasive technologies can motivate people to acquire new knowledge and skills by means of training products that tailor motivational approaches to match each individual learner [2]. Therefore, our strategy to motivate students with different cognitive strengths and weaknesses is to include Gardner's theory in the design of activities for the software.

2.3 Literary Character: Papelucho

An important aspect of motivating children to read was to find an appropriate literary character that would appeal to them on different levels, but especially, in a credible way. In our search to find such a literary character for children we came across Papelucho [8]. We chose Papelucho for his importance as a Chilean literary character for children. Both teachers and children are familiar with Papelucho at school since its 12 books are part of the suggested reading list for children in Primary education in Chile. But perhaps more important, children can easily relate to Papelucho because of his charm and magic which comes from his imagination, how he approaches daily situations, interacts with simple objects and creates extraordinary adventures with them. In this way, children can easily make a strong connection between Papelucho and the real-world environment children live in.

Papelucho and Gardner's Multiple Intelligences Theory. The creation of products is a core element in the definition of intelligence by Gardner [3]. In this 12-book saga, its author Marcela Paz portrays Papelucho as an ordinary 8-year-old boy who has an amazing ability to create and imagine new situations by interacting with his daily environment. Papelucho has the skill to create a story from simple and unexpected things. His entire environment may be subject to transformation. As such, we could design activities that incite children to create new products by using simple materials they can find both at school and at home.

Papelucho and Persuasion. In order to motivate children to read we used three principles from Captology: similarity, tailoring and credibility [2]. First, regarding similarity, Papelucho could act as a companion that children would think was similar to them and would motivate and persuade them more easily. Papelucho is roughly the same age as our user group and shares the same nationality so children can relate to the stories and environment described. Second, in correlation with the principle of tailoring, we expect children to pay more attention when they believe that messages are tailored for them since Papelucho uses the same words a child would use. Finally, regarding the principle of credibility, for fifty years now, Papelucho represents children in a good and believable way in the eyes of children, teachers and parents.

3 Design of the Software

The task of building a reading habit implies pedagogical work. We wanted to avoid creating an environment where the learning process would be associated with obligation and tied to measuring performance through tests, which usually results in rejection and somewhat of a blocking attitude from students. The pedagogical work required was focused on motivating children to develop their synthesis skills, comprehensive reading, achieving more vocabulary and ideas, critical thinking, and mastering narration structures. Game-like activities connected to the real world became an excellent tool oriented to achieve and support this pedagogical approach, as an instance of expression and free access according to personal interest and skills from students.

We needed to create a space where children could rehearse and practice the target behavior of reading and writing. In our software children can freely explore different activities according to their interests. These activities are instances where children can decide whether they want to *Read*, *Write* or *Create a Product* (game). We included game-like activities where children create products for two reasons. First, the creation of products is a core element in the definition of intelligence by Gardner [3]. Second, we were running the risk of excluding non-readers by only having writing and reading activities on the software. Therefore, by including games, children with reading habits and those who have not yet developed such habits have room for decision on what they want to do next with the software (i.e. read, write or create a product). Non-readers who are initially not drawn to reading or writing activities will be slowly exposed to the world of Papelucho by creating products and may feel motivated to read the book. Thus, the ultimate goal of the software is reached when children take one book from Papelucho's saga in their hands and read it, or when they start creating and writing their own stories with the help of the software.

3.1 Circus Metaphor

The metaphor for the interface is a circus. It is a place where diversity lives, where different characters share the same space and situations. It is a place where you can express personal motivations. A circus is a place where many creative performances take place; the happiness, enthusiasm, and creativity from the master of ceremony are critical to create this magical environment that surrounds the circus. At the circus, audience involvement is vital. Unlike at the movies or theater, here laughter, cheering, exclamations and having the audience holding their breath for a second, are part of the show. The circus metaphor together with Gardner's theory allowed us to get together in one place and reach children with differences in the stage of their learning process, in cognitive strengths and weaknesses, and in cultural and social backgrounds.

3.2 The World of Papelucho

Papelucho is the central part of this experience. His aura is present in every aspect of the software. What makes Papelucho so special is how his imagination builds these wonderful and motivating stories out of simple objects. Thus, the circus Papelucho creates should be made of simple elements found in the real world, just like the stories described in his books. If children would not believe that Papelucho created this circus from his imagination, then the entire credibility behind the software would go away.

3.3 Navigating Through the Software

Presentation. It is a short introductory animation sequence (Figure 2). The goal of this presentation is to set the user in the context of how Papelucho is lost in the countryside, on a moonlit night and finds an abandoned Circus trailer. He goes into the trailer, picks up some elements, and decides to create a Circus. As these elements are scattered downhill in a circular shape, they form the circus ring.

Circus Interface. In the main interface children can freely decide what Circus act they want Papelucho to perform. However, this Circus only runs if children actively help Papelucho prepare the acts, providing an open invitation to participate. Therefore, it is children who have to read, write or create a product and Papelucho will accompany them along the way. There are two main components to this interface (Figure 3, left). First, there is the circus trailer at the top of the hill where children help Papelucho in the preparation process of the act. Second, there is the circus ring where final acts are performed after children have finished the creation of a product.

Each of the objects that form the circus *ring* represents one *act* of the circus. For example, the stool represents the Lion Tamer act. Each *act* represents one of Gardner's Intelligences. However, children are not aware of this. It is our pedagogical goal to reach children with different cognitive strengths and weaknesses but for children, it will only be an *act*. Children access each act by clicking on the corresponding *object* (or icon). Once a given object has been chosen by a child, Papelucho places this object in the middle of the circus *ring* to begin the preparation process of the *act*.

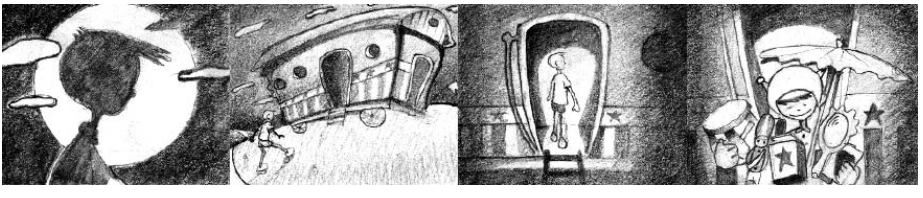

Fig. 2. Storyboard of the Presentation. Papelucho is lost in the countryside, finds an abandoned circus trailer. He enters the trailer and selects some objects he will use to create a Circus.

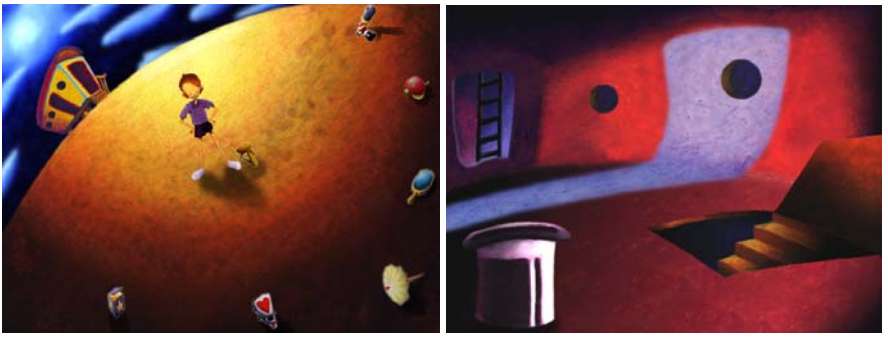

Fig. 3. Circus Interface (left). Objects scattered in a circle by Papelucho form the circus ring. Each object represents an act of the circus and one of the seven Multiple Intelligences. Circus Trailer Interface (right). Here children decide what activity they want to do by taking the ladder for reading, choosing the hat for writing or going down the hatchway for creating a product.

Circus Trailer Interface. This is a transit space where children have the chance to decide what kind of activity they want to do: *Read*, *Write* or *Create a Product* (Figure 3, right). Suggestive sentences invite children to the corresponding activities. By following the invitation "there is a *"lettery"* (starry) night!" children will use the *Ladder* that takes

them to the roof and the reading activity. By following the invitation "Let's go *storytelling* (fortune telling)!" children will go down the *Hat* which will take them to the writing activity. Finally, each act had a different invitation for the creating a product activity. In the case of the Lion Tamer act, by following the invitation "Dare to tame!" children take the *Hatchway* leading to the basement and *Create a Product*.

Reading Interface (Roof). Should children decide they want to Read, Papelucho follows them to the roof. A starry night is the perfect background for this reading session. Since Papelucho's books are structured as a diary, in our software the text children read refers to one day in Papelucho's life. This text is closely related to the intelligence chosen. The reading interface can be found on figure 4.

Writing Interface (Hat). Motivation to write is by far the most difficult thing to achieve among the three main activities. Children are given three concepts related to Papelucho and the chosen intelligence. Papelucho is disguised as a Fortune-Teller (Figure 5). With the use of a crystal ball Papelucho randomly proposes three concepts. These concepts are a character, a place, and an object that can be found in Papelucho's books. Children must link these three concepts into a story that they write down away from the computer on a real physical notebook called "the Fortune-Teller book". This is a direct link to Papelucho's diary-like format in which it is written.

Preparing the Act Interface. Should children decide to create a product, this is the place where they help Papelucho to get his act ready. Children usually need simple elements taken from their environment for this purpose, mainly things they can find at

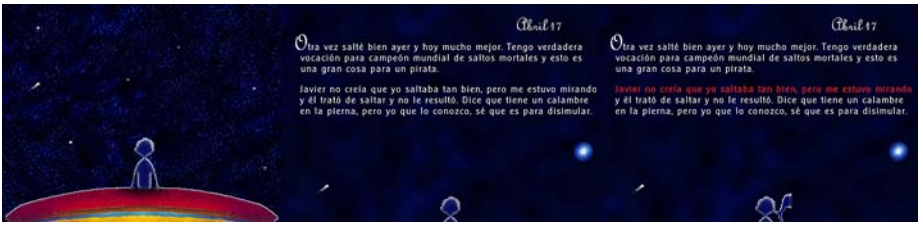

Fig. 4. Reading Interface. In the "lettery" (starry) night (left), children can read a day in the life of Papelucho (center). Children can receive assistance in reading by means of a karaoke mode where the passage is read to them out loud while text is highlighted (right).

Fig. 5. Writing Interface. Papelucho goes down the hat (left) and becomes the "storyteller" (fortune teller) to help children feel motivated to write stories (center). Papelucho proposes three concepts on the crystal ball (right).

school and at home. In this way we allow children to perform activities with the guidance of the computer at school and without the need for a computer at home. For example in the bodily-kinesthetic intelligence, children work with the software, choose an animal and follow a step-by-step tutorial on how to build an Origami figure in the shape of the chosen animal for Papelucho to tame (Figure 6). Once this figure is built, Papelucho can interact with it. Once children are familiar with the concept of building Origami animals, teachers can print a 1-page manual that children can follow step-by-step to build another animal at home without the need of a computer.

Presenting the Final Act. Offering praise for completing a task or performing a given behavior can lead to staying on task longer and getting a better understanding of the material [2]. In this case, the kind of praise is not only a virtual praise but also praise in the real world. The origami figure has the exact appearance on screen as the paper-Origami animal children chose to build. In this way, children will easily relate the paper figure they have in their hands with the animal Papelucho is taming (Figure 7). The main reason for doing this strong link between virtual and real objects is because we want children to perceive a continuum between creating an origami figure with the assistance of the computer at school and creating origami at home with the help of printed material. Similarly, this continuum is created for reading. They can read one day in the life of Papelucho on the computer at school, but they can also take the book home and read it. Thus, the experience of the software is not limited to school or to having a computer.

Fig. 6. Preparing the Act Interface. In this case, children first pick an animal (left) and then follow a step-by-step tutorial on how to build an Origami figure of the chosen animal (right).

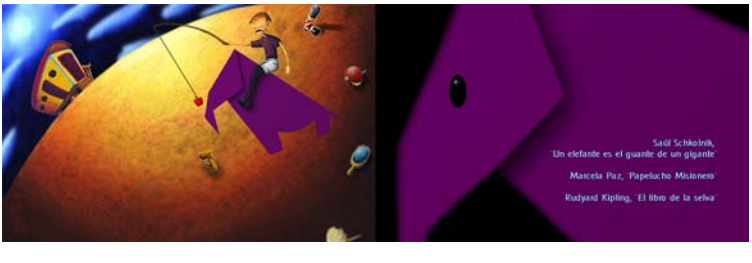

Fig. 7. Presenting the Final Act. Once students have built the paper-Origami animal, Papelucho performs the "Lion Tamer" act (left), offering children praise for building the animal. Next, a list of suggested books that children can find at school is presented (right).

At the end of the Final Act, the software attempts to motivate children to read books. It does so by offering suggestions based on a list of books that are directly related to their preferences (i.e. the animal children chose to build as an Origami figure) and that are available at school for children to borrow them.

4 Evaluation

We have conducted exploratory studies to probe the reactions of children (n=50) towards the software. Two very different audiences have tested this software: first, children from a private school in Santiago, Chile who had experienced other educational software beforehand, and second, a very particular audience: native Chilean Indians, the Mapuche. These children live in the countryside not coming often in contact with the city, had hardly ever seen a computer and were unfamiliar with Papelucho. Most of them had some kind of learning difficulty due to unclear and unstructured bilingual education in their own tongue, Mapudungun, and Spanish.

We were not performing a usability test of the system but instead we were trying to investigate two things. Our first research question was "do children feel motivated to use our software?" In this case we wanted to see whether our approach of motivating children in a way that is credible and connected to the real-world environment children live in had been successful or not, especially with such differences in the children's environments (i.e the city and rural areas). Our second research question was "are children able to create a product (i.e. building an Origami figure) regardless of differences in age (i.e. between 8 and 11 years of age), cognitive strengths and weaknesses, and socio-cultural background with the help of our software?"

Fig. 8. Evaluation. Setup with children and experiment leader (left), children building the origami figure (center) and cutting the origami figure (right).

4.1 Method

This software was tested in four different schools, one from the city and three rural. In order to address differences in both contexts (city and rural), we had two approaches. In the first case, since children from the city had experienced other software beforehand, training by the experiment leader was almost solely connected to explaining how children could interact with our software. In the second case, since Mapuche children had hardly ever seen a computer before, let alone a laptop, training sessions were first focused on introducing children to a computer including how to carry out tasks on a WIMP (windows, icons, menus and pointing devices) environment.

The second part of the training session was connected to explaining the interaction with our software. Training sessions were 30 and 40 minutes long respectively.

The evaluation itself began after the training session. Children were separated according to their class to see how they would react to building the Origami figure. We had 4 different groups of 6-9 children, one group for each age (i.e. eight, nine, ten and eleven-year olds). The eight-year olds went first because we thought more dedication would be needed for them to be able to build the figure. Children interacted with the software in these groups with the assistance of the experiment leader. Children were asked to follow the step-by-step procedure of building the Origami figure with the assistance of the software (Figure 8). Children interacted with the software for another 30 minutes, for a total evaluation time of 60-70 minutes.

4.2 Initial Results

These initial results are based both on qualitative comments made by children and on observations made by the experimenters during the evaluations. Regarding our first research question, we were first looking whether children felt motivated to use our software. Throughout the evaluation, children from both the city and rural areas were drawn to the audiovisual experience of the software, especially to its attractive illustrations, animations and original music. During the training sessions led by the experiment leader, children shared their positive feelings towards the software with the rest of the group. After a while, children who did not know Papelucho slowly started asking things about him: “where is he from?”, “where does he live?” Thus, children were able to make a transition from being impressed by the software to focus on exploring who Papelucho was. Second, our approach of motivating children in a way that is credible and connected to the real-world environment children live in made sense both for children from the city and rural areas. Because the activities presented by the software were connected to simple objects and situations (i.e paper animals, a child lost in the countryside) they made sense to both groups of children. They were equally interested in the software itself and the activities it proposes.

Regarding our second research question, all students were able to understand and follow the different steps of the process to build the Origami figure. Only 5 students had problems with the final step of cutting a specific shape with scissors. These 5 children received the support from classmates and were able to complete the cutting process. Therefore, to our amazement, both in the private and rural schools, all children were able to build the Origami figure, regardless of age, social and cultural background, and individual differences in their cognitive skills.

5 Conclusions

We have designed educational software to motivate children between 8 and 11 years of age to practice the target behavior of reading and writing. Our strategy to motivate children consisted of designing activities that consider three aspects: first, that acknowledge individual differences in the learning process of children by integrating Gardner’s Multiple Intelligence theory; second, that support children in achieving

their goals by including principles of persuasion; and third by including Papelucho as means to reach children in a way that was appealing to them.

The results of exploratory studies with children from one private and three rural schools show the software was able to motivate children to read and perform the activities it proposes in an enthusiastic way. Our approach of motivating children in a way that is credible and connected to the real-world environment of children helped us reach a very diverse audience in a way that made sense to them. By including these three aspects (i.e. Gardner, Persuasion and Papelucho) we have reached the objective of designing activities that address differences in age, cognitive strengths and weaknesses, and socio-cultural background. Our results show how by integrating principles from Persuasion together with theories such as Gardner's in educational software, audiences with age, sex, social, economic, and cultural differences can be reached using the same software and can help us motivate children, and others, to read.

Future work includes a follow-up study where the long-term impact of the use of this software in a classroom can be assessed. We will compare whether children are more motivated to read Papelucho when using the software than if the character is introduced to them in a different way (e.g. by simply listening to the story). Finally, children will be able to explore all intelligences and not only the bodily-kinesthetic intelligence where all children end up making an origami animal.

References

1. Alexander, P.A., Fives, H., Buehl, M.M., Mulhern, J.: Teaching as persuasion. Teaching and Teacher Education, Volume 18, Issue 7 (2002) 795-813
2. Fogg, B.J.: Persuasive Technology: Using Computers to Change What We Think and Do. Morgan Kaufmann (2003)
3. Gardner, H.: Intelligence Reframed: Multiple Intelligences for the 21st Century. Basic Books (1999)
4. Knulst, W.: The readership of books in times of de-reading. Poetics, Volume 31, Issues 3-4, (2003) 213-233
5. Mason, L.: The process of change through persuasion: a commentary. International Journal of Educational Research, Volume 35, Issues 7-8 (2001) 715-729
6. Murphy, P. K.: Teaching as Persuasion: A new metaphor for a new decade. Theory into Practice, 40(4) (2001) 224–227
7. Papalia, D.E., et al: A Child's World. Infancy through Adolescence. McGraw-Hill (1986)
8. Paz, M.: "Colección Papelucho", Ed. Universitaria (1997)
9. Piaget, J.: The general problems of the psychobiological development of the child. Proceedings of the World Health Organization study group on the psychobiological development of the child, Vol. IV (1960) 3–27
10. Sinatra, G., Kardash, C.M.: Teacher candidates' epistemological beliefs, dispositions, and views on teaching as persuasion. Contemporary Educational Psychology, Volume 29, Issue 4 (2004) 483-498
11. Verboord, M., van Rees, K.: Do changes in socialization lead to decline in reading level? How parents, literary education, and popular culture affect the level of books read. Poetics, Volume 31, Issues 3-4 (2003) 283-300