

Teaching an Alien: Children Recommending What and How to Learn

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Abstract—In this paper, we describe how, inspired by fiction design, primary school children are helping us to create a teachable 3D Tutor, with the appearance and personality of a friendly Alien. In line with existing literature, we assume that children enjoy learning by teaching. By making the overall process more fun, the level of children’s engagement and their motivation towards it will increase. In our study, children will act as recommenders, as they are asked to prepare the lessons. They need to decide and select the material to teach and the way it is presented to the 3D Alien, to make sure s/he will have a successful learning experience. We will test the validity of these recommendations by measuring the level of engagement in children of the same age group when offered these lessons.

Keywords- Teachable tutor; fiction design; collaborative design; teaching style.

I. INTRODUCTION

Technology is used to support teaching and learning in many ways. Here, we are working toward the design of a 3D Tutor, a friendly Alien, to act as a teachable agent to engage primary school children. Teachable agents are defined by Biswas et al. [1] as a “...computer agents that students teach, and in the process, learn themselves.” Children asked to teach them are encouraged to structure their knowledge, take responsibility for its delivery and reflect upon it. These are all essential steps in the learning process. Both the social and emotional dimensions of teachable tutors are still under study. Our work contributes to this research by exploring the impact of one of its possible manifestations, that in the shape of a 3D holographic tutor.

In the first stage of this project, we involved 154 school children, attending primary 2 and aged 7-8 years, in the definition of the look and feel of their teaching tutor-agent, a friendly Alien, as in Figures 1 and 2, to design one that better satisfies their needs. Besides, given that our tutor will learn from children, we have revisited the list of qualities proposed by Buskin et al. [2] and focused on few of the most highly ranked in that study. In a previous study, we found out that for our pupils, as for the older students in that study, it is crucial that their 3D Tutor *should be enthusiastic about learning, promotes critical thinking, approachable,*

respectful, creative, has realistic expectations [4]. In this paper, we explore how children can act as recommenders for other children as they are asked to prepare few lessons, i.e., decide and select the material to teach and the way it is presented to the 3D Alien, to make sure s/he will have a successful learning experience.



Figure 1. The first meeting



Figure 2. The friendly Alien

This paper starts by quickly describing in Section 2 the relevant state of the art in teachable tutors and moves on to present in Section 3 the details of our study. In Section 4, we describe how we run a focus group with a class of 16 children aged 8-9 when we examined issues related to children's preferences in learning activities. Section 5 is where we explain the activities planned for engaging children across two schools in the preparation of the lessons; to focus initially on geography as part of their school curriculum. Finally, Section 6 provides conclusions and open issues.

II. RELATED WORKS

We started from the approach defined in [8] on how co-design can help the production of active digital tutors for children and were also inspired by the work described in Herberg et al. [3] involving children in the identification of qualities for an ideal robot tutor. Particularly suitable for young children is fiction design, where “something that creates a story world... has something being prototyped within that story world, ... does so to create a discursive space.” [5]. Moving on to consider research on the design of teachable tutors [1], Ogan et al. [6] go on to explore their social dimension. They report on how having a friendly, equal approach, where the tutor and the child align themselves to be peers, together with being able to use informal interactions, is conducive to successful learning experiences. On the contrary, keeping a formal distance hurts the overall experience. Tanaka and Matsuzoe [7] describe an experience in using a teachable robot with primary school children. They explore three different types of teaching style such as: *direct teaching*, step-by-step, hands-on instructions given to the robot. *Gesturing*, with children moving their bodies to show a procedure to the robot. *Verbal teaching*, with children giving vocal instructions to the robot. All of them provide a significant level of closeness between children and robot by mimicking the one between parents and child. While most of the available literature reports on pro and cons of having robots to play the role of the tutor, we set out to explore an alternative, that of a 3D holographic entity. Moreover, the impact it can have on the learning by teaching process, taking place among peers.

The 3D Tutor is a 3D character animated in real-time, able to interact through different senses (touch, voice, vision) and to convey emotions together with information in lessons. By using Artificial Intelligence, the 3D Tutor can choose the right question/topic. By using Artificial Empathy, the 3D Tutor can recognize users’ emotional state and engagement to react appropriately. Thus, the content is adapted to both the conditions of the student and the specific device used (mobile device, web, classroom). With the 3D Tutors, teachers can explore new ways to present subjects to students, as well as encourage students to find the learning preferences that suits them best, by fully exploiting the teaching agent paradigm. The concept of a 3D Tutor is based on that of Human-like Interaction (HLI) [3]. HLI implies the use of all dimensions of human language, not only written or verbal communication but also gestures, postures, and facial expressions.

Here we explore how this paradigm can enable children to learn from peers that act as recommenders not only of suitable, relevant and challenging material but also of fun and engaging ways to present and learn it.

III. OUR STUDY

The work described here is part of a more extensive study started one year ago and initially involving 5 (Italian) + 1 (Swiss-Italian) classes of primary school children following the same curriculum in two different schools. Children have since moved on the primary three under the

supervision of the same teachers from the previous year. Two of the classes initially involved have opted out our study. Thus, we are left with 66 children and four teachers. Pupils are now practicing how to study three main subjects: history, geography, and science. Teachers have decided to focus on geography when planning activities for children to produce content for our teachable tutor. The first step we took was to run a focus group in one of the classes, to find out how aware children are of their different learning preferences.

IV. THE FOCUS GROUP

We have run an initial focus group during school hours, involving 16 children and two teachers. These stayed in class but did not take part in the discussion to let children free to express their opinions. We started the discussion by using the same fiction design trigger as in the previous year: our friendly Alien wanted to know more about our planet, maybe they could teach him. Children reacted enthusiastically, and in their discussion, they explored the following themes.

Learning preferences: Children were asked about their favorite subjects, what they liked to learn and how. Each came up with his or her favorite subjects but also with the preferred place, time and type of activities for learning. Few of them reported on the tips they were given by older siblings and parents, mostly to overcome problems with difficult subjects and in general fear and anxiety about oral and written tests. It emerged that sharing these recommendations in class made them feel more positive about their validity. Overall children felt confident about recommending what and how to learn to their Alien friend.

Differences count: two of the children pointed out we are all different and react in different ways to learning strategies. Not only children have different tastes and inclinations, but also their level of interest in the lesson presented can vary, in relation to how tired or hungry they are. They recognize that their teachers could spot these changes happening as they know them very well.

Teaching styles: not only their teachers knew them well enough to understand their level of engagement with a lesson, but they also found the best way to have them engage in it by changing the teaching style. One of the children pointed out how, when she was getting frustrated with a math exercise, her teacher turned it into a game to involve the rest of the class. Now, when the same child is asked to solve a similar exercise, she feels very confident, and this helps her to succeed.

Games for learning: children came up with many examples of how to turn an exercise into a fun game. Inspired by their favorite board games and television quizzes, they started to play with simple grammar rules they just learned and gave us a demonstration of how that worked out very well. They continued by providing examples from topics encountered in geography when describing a compass, and history, when they engaged in an impromptu storytelling session, starting from a “what if I had a dinosaur in my back garden.”

Lack of participation: even if the majority of the children was enthusiastically taking part and competing to get

attention, they noticed how three of them were not engaging at all in the discussion. When asked about signs of participation, children started from the eyes: bright, wide open, in contact with the speaker. Being focused and not fiddling with objects on the desk, not talking with neighbors, raising hands to contribute, were all excellent signs of engagement. Thus, we proposed two children at a time to play inspectors for the lack of these signs while the others were trying to make discussion fun.

Playing inspectors: playing inspectors proved very successful with children already engaged with the class, they seemed to enjoy that role and were extra careful in spotting every signal of disengagement.

Playing teacher: proved much harder and unfortunately, we did not see any change in the level of interest in the three children that were not involved from the start; even when the other children tried the engagement strategies their teachers had successfully used with them.

The exercise was helpful in revealing how much children were aware of the strategies and alternatives available for learning and teaching. This awareness will guide them when preparing the lessons for the teachable tutor and their peers.

We interviewed their teachers immediately afterward as they had listened to the discussion without taking an active role in it. They were impressed by the quality and variety of reflections provided by the majority of children, given they had just started to learn how to study. Teachers also confirmed how two of the three children, who were not participating in the discussion, had similar behavior in class, due to independent reasons. The third child was merely very tired for not having slept the night before. It was agreed that for future meetings, when children would prepare the lessons for the Alien, two of them, on turns, will act as inspectors.

V. PLANNED ACTIVITIES

Together with the teachers, we have planned some activities to support children in the preparation and delivery of geography lessons. Following the fiction design approach, the process will start with a request for help sent by their Alien friend. In the message, s/he will ask children for assistance on how to use maps for finding his/her way on our planet. In particular, s/he will ask for the best path to go from A to B, using terrestrial maps. In exchange, Alien will teach children how to use space maps. Through phases of growing complexity, the students will work on a group project about how maps are made and used with local examples. Children will start focusing on the part of the city where they live, analyzing different types of maps, including the historical one. This way they will acquire enough expertise to teach the Alien how to choose and read the correct map to serve different needs. In the second phase, they will put into practice what they learned, exploring local places of interest, going around and recording everything they feel interesting for their Alien friend. They will take notes and pictures to draw a personalized map. At this point, based on the material produced, they will deliver their first lesson to their Alien friend, during a Skype session. In the third phase, they will be asked to plan a short tour in their school neighborhood, going again on the road.

Moreover, then create some VR content using VR cameras and tablets. Thus, children will set a practical activity for the Alien, e.g., draw, on the previously shared map, the path of the VR tour. The final phase will bring students and Alien to work together on designing a brand-new map answering the following question: if they were kings, how they would change the area they live to make it more children-friendly?

VI. CONCLUSION AND OPEN ISSUES

Here, we have described the results of a focus group run with primary school children to explore their attitude toward learning and teaching. The focus group was run in preparation for the design of lessons to be prepared by children for their teachable 3D tutor, a friendly Alien. By following a fiction design approach, we will engage children in some curriculum-related activities and get them to produce material suitable for their peers. Children will also organize this material in lessons to be interesting and fun for the friendly Alien and their peers to learn. We will then measure the level of engagement these lessons generate in other children of the same age group.

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