Towards Virtual Agents for Supporting Appropriate Small Group Behaviors in Educational Contexts

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Abstract—Verbal and non-verbal behaviors that we use in order to effectively communicate with other people are vital for our success in our daily lives. Despite the importance of social skills, creating standardized methods for training them and supporting their training is challenging. Information and Communications Technology (ICT) may have a good potential to support social and emotional learning (SEL) through virtual social demonstration games. This paper presents initial work involving the design of a pedagogical scenario to facilitate teaching of socially appropriate and inappropriate behaviors when entering and standing in a small group of people, a common occurrence in collaborative social situations. This is achieved through the use of virtual characters and, initially, virtual reality (VR) environments for supporting situated learning in multiple contexts. We describe work done thus far on the demonstrator scenario and anticipated potentials, pitfalls and challenges involved in the approach.

Index Terms—Virtual Agents, Virtual Reality, Social & Emotional Learning, Politeness, Demonstration Games, Small Groups

I. INTRODUCTION

Group activities are an important part of our daily lives, foundational to many collaboration and learning activities. Forming, joining, leaving or engaging others in small groups may seem simple to adults, but conducting socially-appropriate behavior is often context-sensitive, subtle and complex. The stakes are high: failing to do it can cause offense and have negative repercussions, even if unintended. In order to navigate complex social landscapes, one must learn the difference between how others view polite and impolite behaviors. These competencies are related to the Social and Emotional Learning (SEL) process, developed by the Collaborative for Academic Social and Emotional Learning (CASEL) [1]. SEL is a pedagogical process for skill development related to how people feel and show empathy for others, establish and maintain positive relationships and make responsible decisions. Studies have shown that students who take courses in SEL show improvement in social skills and academic performance [1].

There are a number of challenges for SEL in modern education. Especially, teachers need support for teaching social competencies to students. These relate not only to standardized and validated training tasks, but also personnel requirements. Furthermore, students may feel anxious when engaging in activities with their peer group. Even in apparently informal game-play situations, there may be real-world consequences that may result in anxiety for participants and disengagement from activities. Information and Communications Technology

(ICT), such as virtual agents and virtual reality (VR), has the potential to assist teachers in SEL activities. VR can provide diverse, immersive, stimulating learning environments which are too expensive, dangerous or simply not possible in the real world. Virtual environments and objects are highly customizable with a relatively low cost. Especially for social demonstration games in which human bodies and their behaviors are important, virtual agents may be cost-effective in specific situations. Overall, these potentials provide an opportunity for situated learning, facilitate observational learning, learning by doing and learning by teaching (see [2] for overview) in safe, simulated situations.

Towards this goal, we propose a virtual reality demonstrator to facilitate SEL in small group scenarios. Specifically, the demonstrator involves approaching and joining a group in a polite manner, orienting towards them to make them feel included in the group and not obstructing or blocking the view of others by standing in front of them or violating their personal space. We intend for the demonstrator to be able to provide examples of a range of polite and impolite behaviors to reinforce learning goals that reflect the individual nature of humans across age, gender and culture.

II. RELATED WORK

Expressive virtual agents have been previously applied to social skills training to enhance social competencies [3]. For example, Tanaka et al. [4] used virtual agents to assess listening skills and Jones et al. [5] used them for expressing social attitudes. See [6] for an overview interactive agents dedicated to social training. Theoretical background work involving small group formations, including the definition of F-formations, o-spaces and personal spaces [7], [8] is a basis for designing the social demonstrator and have been used to model and study group joining and leaving behavior [9].

III. SCENARIO

Cartledge et al. [10] proposed a theoretical model followed by learning activities to teach and develop social skills, specifically to teach students how to join a group in a polite manner or respecting individual's personal space which is embedded in our demonstrator. Based on this model, defining a behavior to be taught, is the first step. Then, the proficiency of students in that specific behavior should be assessed before and after the teaching phase by the teacher. Teaching might be repeated

until receiving satisfactory results from teacher's perspective. In a final stage, students generalize and maintain what they have learned over time.

Our work-in-progress virtual reality demonstrator is being implemented using Unity 3D and MCS characters¹. It consists of a teacher dashboard (including a camera view into the VR environment) and the virtual reality training environment containing an avatar controlled by the student and a small group of three virtual agents. The task of the student is to walk up to the small group and to join them. The teacher may choose a scenario involving the virtual characters, including their embodiment and social characteristics. They may also select one of two modes on the demonstrator: training and test. In the training mode, the environment is annotated for the student and social information is visualized for them, such as if they are blocking the line of sight of a group member or standing too close to them. The test mode is not annotated with social information and is therefore more challenging. In this mode, there is less real-time feedback and students must rely on the motion-captured reactions of group members. Regardless of the mode, post-demonstration, the teacher may playback the scenario from multiple perspectives (including those of the group members) in order to debrief them on their performance. While the system is intended to give some automated feedback e.g. personal space violations, standing in front of others and so on, the main assessment is provided by the teacher. The purpose of the demonstrator is therefore as a support tool for them. It should be noted that the teacher does not need to be present while students are in the demonstration environment: they are only required prior to scenario start in order to set the scenario parameters and after the scenario in order to assess and provide feedback about the outcome.

IV. DISCUSSION

The ability to control and repeat learning tasks in the demonstrator under a variety of safe social situations can support generalization before skills are practised in real situations. For some, virtual environments and agents may also induce less anxiety than engaging in real social situations and participants may also be more at ease [11] to participate in social experimentation and role-play.

More generally, VR provides an opportunity to be exposed to different situations in a safe manner for participants. There might be minimized risk of adverse social effects for students when engaging in behaviors in virtual environments, increasing their willingness to participate and investigate social behaviors that they may be hesitant to do in real-world training scenarios. However, this needs to be measured against adverse effects from the equipment, such as motion sickness. Other benefits include the ability for students to experience their behaviors from other perspectives in real-time. VR supports demonstration of features that are not visible in real-life, such as social distances.

There are also a number of limitations. Setting up virtual reality platforms in schools with children is time and energy consuming and may not be practical for large or even medium cohorts. Also, teachers must conduct the feedback process manually, but there may be possibilities to semi-automatize it through feedback metrics related to degree of personal space violations, inappropriate body orientations, occlusions and trajectories in order to better support the teacher. The social presence of virtual agents is also generally far lower than humans, although as mentioned previously, this could be beneficial to reduce initial feelings of social anxiety. However, an open question is how interactions with such agents may then generalize to real interactions that involve high degrees of social presence and how the social presence of virtual agents may be improved. Overall, this work is a proof-of-concept that we will use to study these limitations and potentials, with a view to the use of augmented reality handheld devices.

V. CONCLUSIONS

We presented a pedagogical scenario embedded in a virtual reality demonstrator as a tool to support teachers. Its purpose is to facilitate teaching appropriate behaviors when joining and interacting in small groups through social demonstration. As a next step, we plan to further develop the demonstrator and conduct testing to improve it. We will also use the demonstrator as a basis for designing similar scenarios that utilize augmented reality via handheld devices.

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¹<http://morph3d.com>