

PROMOTING SOCIO-EMOTIONAL LEARNING WITH A VIRTUAL ROBOT FACILITATOR OF SMALL GROUP DISCUSSIONS: A CROSS-CULTURAL STUDY

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ABSTRACT

In this contribution, we present continued work-in-progress on an innovative system for facilitating small-group online discussions using an avatar during a video conference. Previous studies have shown that the system had an effective, understandable, and more participatory interaction that is sustained during a long-term interaction. Here, we examine long-term, cross-cultural effects on socio-emotional learning (SEL) for 5th and 6th graders in Israel and 3rd, 4th, 5th graders in Italy. Eight elaborate activities were designed specifically for this setup to promote SEL in an engaging and collaborative way. Pre- and post-questionnaires regarding SEL were administered to the students, as well as semi-structured interviews. The results of the study show mixed trends, where in the Israel sample students reported a (non-significant) beneficial effect of the activities on their mindset and behavior, while in the Italian sample a different (non-significant) trend was observed. Qualitative analysis of semi-structured interviews after the activities show that children had a noticeable change in their perception of SEL as well as their behaviors. Despite these mixed results, this work-in-progress continues to support the usage of the virtual robot facilitator of small group activities as an effective teaching assistant for school children, even in soft-skills such as socio-emotional learning domains.

KEYWORDS

Virtual agent, group activity, video conference, facilitation.

1. INTRODUCTION

Prior to the COVID-19 pandemic, online learning environments for K-12 have not been a mainstream methodology. However, the pandemic has revealed the importance, as well as the advantages and drawbacks of video conferencing technologies, as well as other social educational technologies. Moreover, the pandemic had a drastic negative effect on children's socio-emotional skills (Bayley et al., 2023).

We report the continued evaluation of a system, that aims to facilitate small online group discussions during video conferencing (Mizrahi et al., 2022a), with a new focus on socio-emotional learning (SEL). Students interacted with the system, which consists of: (i) an avatar, a virtual agent, who manages the educational group activity as well as facilitates the online discussion; (ii) Zoom, and (iii) a screen for the educational content, which is produced on an activity site designed for that purpose.

Previous studies found the system to be effective for discussions and engagement in group activities (Mizrahi et al., 2022a) as well as maintain these effects over a long period of time (Mizrahi et al., 2022b). In this new report, we evaluated the effect of a long-term use of the system on children's socio-emotional learning in a cross-cultural study.

In the study, four groups in Israel (three in 5th and one in 6th grade) and twenty groups in Italy (six in 3rd, eight in 4th grade and six in 5th grade) interacted with the system, performing eight carefully tailored activities promoting socio-emotional learning. All the activities were performed with the avatar facilitation. Questionnaires regarding SEL were conducted before and after the activities. We also conducted semi-structured interviews with children after the activities.

Our results reaffirm that the long-term use of the system does not suffer from the novelty effect (Mizrahi et al., 2022b), and show mixed (non-significant) trends wherein SEL was improved for some of the children. Results suggest that there is no significant cross-cultural difference in usage and engagement, suggesting that

the system can be used in a wide range of locations, but that future studies are needed to solicit site-specific hypotheses and explanations.

This work-in-progress continues to support the concept of a virtual robot facilitator for long-term use in small group online discussions, with an emphasis on promotion of socio-emotional learning.

2. RELATED WORK

Small group learning activities have been considered as a promising education format (Johnson & Johnson, 2009). Small-group activities can enhance student thinking and learning of both formal and informal content and skills, (Hadwin et al. 2018; Webb, 1995).

Studies have shown that personal face-to-face interactions and discussions in small groups have their advantages (Thomas & Thorpe, 2019), also in online settings (Love & Simpson, 2005). The question of scaling-up group facilitation is, thus, of prominent importance. In group activities, the role of group facilitator is important in facilitating learning-related processes (Franco & Nielsen, 2018). This is because when students have a supportive environment it will foster both the understanding of the content learned, the task value, and positive beliefs about the students' abilities and thus their motivation to learn (Pietarinen et al., 2021).

The appearance of virtual visual agents, avatars, has also initiated a wider usage of conversational and social aspects of interaction. While a face of a conversational agent has been shown to increase rapport and other participant-agent-related measures (Shamekhi et al., 2018), it remains an open question of what *educational benefits* such an avatar presents. Although guiding agents may have disadvantages, they have been found to have the ability to manage time better, to be more objective and efficient than a human facilitator (Rosenberg-Kima et al., 2020).

Extensive developmental research indicates that effective mastery of socio-emotional competencies is associated with greater well-being and better school performance, whereas the failure to achieve competence in these areas can lead to a variety of personal, social, and academic difficulties (Durlak et al., 2011; García-Poole et al., 2020). Promoting socio-emotional learning (SEL) refers to promoting adaptive emotion regulation skills (e.g., management of negative emotions, and expression and reinforcement of positive emotions), as well as perspective-taking, interpersonal communication skills, and responsible decision making. Interventions aimed to promote SEL have mostly focused on elementary school children (Holsen et al., 2008).

This study addresses the question of whether a long-term use of an online learning system with video conference guided by a social virtual agent can promote socio-emotional learning in school children.

3. METHODS

THE SYSTEM: The system is composed of a student-centered site, with which the students interact. The site includes: (a) a robotic avatar from SitePal.com (b) a frame with the Zoom web API, that enables gallery view to see all the group members and; (c) an interaction part, which shows the content and enables answering questions (see more details in Mizrahi et al. (2021)). The avatar was programmed with best practices of group facilitation behaviors. An expert group facilitator aided in formalizing the appropriate behaviors, e.g., how to give feedback and how to handle objections, which were then programmed into the avatar.



Figure 1. Examples of some of the vignettes showed to the children during the online activities in the platform

THE ACTIVITIES: The intervention included 8 online sessions focusing – in order – on: anger, sadness, hostile attribution bias, effortful control, positive emotions, empathy, responsible decision making, and a final session retracing the previous ones. The sessions were created following the guidance of the following previously-validated programs aimed at promoting children’s SEL-related competences: CASEL (Collaborative for Academic, Social, and Emotional Learning) (CASEL, 2017); CEPIDEA (Promoting Prosocial and Emotional Skills to Counteract Externalizing Problems in Adolescence) (Caprara et al. 2014; 2015); The Coping Cat Program for Anxious Youth (Kendall et al., 2003); Keeping your cool - anger management program (Nelson et al., 2006); Stop & Think Social Skills Program (Knoff, 2001); The Promoting Alternative Thinking Strategies (PATHS) curriculum (Kusche & Greenberg, 1994). Thus, the sessions were inspired by the aforementioned programs, but adapted to be implemented online with small groups of children.

During each session, vignettes created by Laura Di Giunta based on some of the modules of the aforementioned validated protocols and illustrated by Miss Clementina Comitale (**Error! Reference source not found.**), was presented to groups of 3 to 5 children. Participants were asked to reflect and discuss about the story with the other members of the group. Sessions were moderated by the virtual robot who encouraged children to share their opinions about scenes that were presented.

PARTICIPANTS: The study was conducted on 5th and 6th grade students, in an elementary school in Israel, and in two elementary schools in Italy. Israel cohort: four groups, with 5th grade (4 boys, 7 girls), 6th grade (1 boy, 2 girls). Italy cohort: 20 groups, with 3rd grade (12 boys, 8 girls), 4th grade (14 boys, 18 girls), 5th grades (8 boys, 11 girls).

Given the novelty of the tool, meetings were held in the school in timeslots defined in accordance with teachers, to allow the team to monitor and manage any possible malfunctioning. Participants sat far from each other and in different rooms and wore noise-cancelling headphones to avoid distractions and to enable – as much as possible – interactions to occur through the platform only.

All participants' parents signed a consent form. The study was approved by the IRB in both countries and the ministry of education in Israel.

MEASURES: The study was a mixed-study design, with both quantitative and qualitative. Quantitative measures included child-reported pre-post questionnaires that were administered (Social Skill Improvement System SEL Brief, SSIS SELb, Elliott et al., 2020; Academic Self-Efficacy Scale, ASES; Bandura et al., 1996; Pastorelli et al., 2001). Qualitative results came from semi-structured interviews with the children after the activities.

4. RESULTS

SOCIO-EMOTIONAL LEARNING: We performed a repeated-measures analysis of variance, with gender and country as between-subject factors. There were no significant main effects for SSIS SELb and ASES. There was a significant interaction between gender for ASES ($F(78,1)=16.8, p<0.001$, Pillai’s Trace, Boys: (Post-Pre): $M=-0.23, SD=0.11$, Girls: (Post-Pre): $M=0.15, SD=0.11$). Importantly, there were no significant effects or interaction with the sample location. We report the trends in the different questionnaires: Israeli sample: SSIS SELb ((Post-Pre): $M=0.10, SD=0.59$). Pre: $M=3.89, SD=0.59$. Post: $M=3.93, SD=0.75$); ASES ((Post-Pre): $M=0.13, SD=1.12$). Pre: $M=3.20, SD=1.08$. Post: $M=3.32, SD=0.84$). Italian sample: SSIS SELb ((Post-Pre): $M=-0.06, SD=0.39$). Pre: $M=4.08, SD=0.43$. Post: $M=4.02, SD=0.53$); ASES ((Post-Pre): $M=-0.11, SD=0.62$). Pre: $M=3.83, SD=0.72$. Post: $M=3.72, SD=0.80$).

QUALITATIVE ANALYSIS: We have conducted semi-structured interviews with the children after the interactions. After transcribing the interviews and aggregating them according to themes, we present the major results. When asked “what did you learn?” a common theme that emerged is how children learned to regulate their emotions (“I learned how to respond and how to moderate my reactions”), but also more general concepts (“it was like a new moral for life, go and help a person in need”, “it tried to teach about life, if someone’s sad, what to do about it”). When asked “did you change your behaviors?” a common theme was how to approach other people (“when I saw children sitting alone, I went and helped them”, “I am more caring for my friends”, “it changed my ability to talk and share with my friends”).

One interesting theme that emerged, which has been reported with adults before (Rosenberg-Kima et al., 2020), is the children's ability to share more with the virtual robot than with a person ("It speaks one or two words and then we are the ones that talk", "A robot can't yell. With a teacher they can yell sometimes." "I'd feel more comfortable with a robot than with you [the experimenter]").

Regarding long-term engagement, when asked "did you get tired after so many activities?", children replied with a negative ("it was fun to continue doing it. Even if it's the same concept", "I didn't get tired, it's fun to do these activities"). Almost all children commented that the activities themselves were fun ("I liked its jokes and stories, and I love the questions, they were intriguing", "It was fun doing these activities, you learn and have fun at the same time").

5. DISCUSSION AND CONCLUSION

This short paper introduces a work-in-progress on the evaluation of a novel system that facilitates small group on-line discussion using video conferencing and best practices. While previous work has demonstrated the viability of the platform, as well as its long-term engagement value, we focused more on the activities themselves and its cross-cultural implementation. Several important issues rose during the study.

First, preparing the activities was a large endeavor, which consolidated many known practices of promotion of SEL (Durlak et al., 2011) and adapting them into the virtual robotator format. Using vignettes was highly appreciated by the students, where we never once encountered children who did not understand the activity itself. Furthermore, promotion of SEL cannot be done with a single lesson, hence previous validation of the system as maintaining long-term engagement (Mizrahi et al., 2022b) was crucial for the development and utilization of eight full activities.

Second, while the size of the cohorts was relatively small, hence not enabling detection of any significant change in attitudes and beliefs, as measured by the pre-post questionnaires, we could see some trends that emerge with a beneficial direction in some of the measures in one of the two cultural contexts. The semi-structured interviews reflected both a change in attitudes, but, more importantly, a change in behavior. We have two hypotheses for the different trend of the results across cultures. The Israeli children were slightly older than the Italian ones, that may lead to the hypothesis that the activities might be more effective in late, rather than middle childhood. Second, in line with previous studies on inter-informant agreement (De Los Reyes & Kazdin, 2005), children may have over-evaluated their own socio-emotional competences in the pre-tests and may have increased their capacities to identify and evaluate their own socio-emotional competences in the post-tests, thanks to the activities they were involved in.

Thirdly, the post-activity interviews taught us about important aspects of the system, such as the fact that the virtual robot may be perceived as a better facilitator for such emotional sharing activities (Rosenberg-Kima et al., 2020). This is partly due to the fact of the unbiased attitude of the robot, as well as the nature of the activities, which encouraged children to share their experiences with others, with no judgement or comments from the facilitator itself.

Finally, the comparison between the two cultural studies showed no significant difference in participation and engagement, but in effects of the activities on SEL. Hence, it partly supports the generalization of the usage of the system in more cultures and a wider range of socio-economic status communities, but certainly needs further examination to solicit site-specific hypothesis and explanations.

This study had several major limitations, most notably the continued technical difficulties due to low internet connection of the participants, the small number of participants, and the lack of a control group. Nevertheless, the results reaffirm the promise of the novel system as a long-term facilitator of more discussions and more socio-emotional learning in an environment that is becoming more prevalent in the formal educational system.

Future work aims to use the system at a national level, with dozens of schools participating in a large-scale study, sponsored by the Ministries of Education in multiple countries. Moreover, with the appearance of ChatGPT, future developments include introducing speech recognition that will greatly enhance the effectiveness of the discussions.

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