Intervening for Wellbeing: Developing Social-Emotional Competencies with Technology

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ABSTRACT
Well-developed social and emotional competencies are increasingly understood as one of the key abilities needed to succeed in modern life. An emerging body of literature shows that such competencies are malleable and can be developed through carefully designed evidence-based prevention programs. In contrast, failure to develop these competencies can lead to mental health disorders, lowered academic achievements and risky behavior. As such, the deployment of social and emotional learning (SEL) programs is rapidly increasing, with now more than 44% US schools including a SEL program on a school-wide basis [6]. However, there are still many crucial challenges that these programs are struggling to address: for example, supporting learners in everyday situations, engaging parents in the learning process, designing programs for teenagers, and rapidly adapting programs to changing needs.

We argue that technology can play a crucial part in addressing the challenges in social-emotional learning, effectively extending the reach and impact of SEL interventions. In particular, many of the techniques that have been developed in the HCI community can be used to scale the learning beyond schools boundaries. In this paper, we demonstrate some of the challenges and discuss technologies that can be used to address them.

AUTHOR KEYWORDS
Social and Emotional Skills, SEL, Education.

ACM CLASSIFICATION KEYWORDS
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INTRODUCTION
Well-developed social-emotional (SE) competencies are among drivers of important social outcomes, such as health, well-being, academic and work achievements, and civic engagement [11]. In contrast, failure to sufficiently develop these competencies early on can lead to mental-health disorders (e.g., depression, anxiety) and risky behaviors (e.g., substance abuse, delinquency) [1]. For example, low self-regulation of individuals is strongly associated with multiple societal problems, including increased risk of suicide or self-harm [29], criminal behavior [7], as well as low personal well-being [21] or academic under-achievement [9]. Already by the start of elementary school, children can markedly differ in their ability to self-regulate [25]; and such early-onset differences are predictors for the later negative outcomes mentioned above [21, 7].

Promoting the development of social-emotional competencies for general population has thus become a priority for national governments (e.g., [23]) and international organizations such as OECD [26] or WHO [38]. While prior research indicates that such differences in SE competencies could be mitigated through early interventions, such as universal school-based *prevention programs* (see e.g., [11, 37, 1] for extensive reviews), a *principal challenge of existing programs is how to provide reinforcement of the learned competencies in everyday contexts and beyond the in-school lessons* [3, 17, 27, 32]. In particular, learners must be provided with on-going, in-the-moment scaffolding during naturally occurring 'teachable moments' (such as peer conflicts) in order to transfer the new competencies into everyday life. This critical role is currently left to in-person coaching by adults (teachers or parents), making existing programs highly time- and resource-intensive and substantially limiting the scale and impact the prevention programs could have [11, 17].

This position paper draws on an extensive literature review [32] as well as on-going engagement with leading social-emotional learning researchers [33, 34], including Committee for Children, the developers of the largest evidence-based SEL program worldwide, used by more than 8 million families across 26.000+ schools within US.

Our key argument is that much existing HCI work could be used in support of social and emotional skills learning (SEL) in —and possibly other domains—but that the topic has so far been under-researched. We argue how such technology could fundamentally extend and enhance the possibilities available to social skills learning, such as supporting the embedding of skills in class into everyday situations, promoting reflection, and providing additional environments for practice. We also outline how the focus on SEL would bring the novel op-

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portunities and challenges for HCI, as well as a structure to guide and support HCI in this emerging research direction. These arguments are in line with the emerging focus on promoting wellbeing within HCI as, for example, exemplified by the arguments behind Positive Computing [8], or the last years workshop at CHI [35].

GAPS IN SEL CURRICULA

There are many issues in current SEL curricula that technology is well positioned to address, as described in detail in the recent TOCHI review [32]. In the remainder of the section, we first highlight two example gaps (engaging parents and reaching teens) and how technology may be able to help in mitigating these. This is followed by outlining key SEL challenges in a more conceptual manner.

Engaging parents

Engaging parents in the SEL learning of students has been identified as a main challenge of existing SEL curricula [33]. Since many learning opportunities happen outside of the school boundaries, especially at home or with family, there is a great potential for scaffolding provided that the parents can provide. However, parents are not necessarily aware of the learning done in class and therefore there might be misalignment between the messages the student receives at home and the messages received at school. Connecting the parents to the learning done at school and the vocabulary used is very challenging. Messages sent home not always reach their destination. Moreover, some parents may be struggling with their own social and emotional skills and may use scaffolding themselves.

In our own work, we have experimented with sending messages home which are designed as portals between the physical world and the digital world [34]. The messages come in a form of a decorated postcard that contains a QR code that can be scanned by a smart-phone to enter a digital experience. This portal was design to K-3 grade students that typically do not have a smart-phone and therefore the postcard requires the support of a parent to complete. Once in the digital world, the activity was designed to engage both the parent and the student by going together in a journey that follows a pirate that lost a part of a map to a monkey who snatched it. During the journey the pirate faces emotional and social challenges and the parent and the student are prompted to reflect on similar situations that happen to them. A preliminary study showed that this method resulted in better engagement from parents. Moreover, interviews revealed that both parents and kids were able to use the techniques learned during "hot-moments" since they had a shared vocabulary to talk about it. For example, after doing the activity, some students have reminded their family members how to come down like the pirate.

Reaching teenagers

Another challenge for SEL curricula is creating a delivery channel to middle-school and high-school students. While there is much progress in SEL programs for elementary school students, the same techniques do not work in the higher grades. Part of the problem relies on the school structure in which there is less time in a home class to discuss such matters, but also strongly by developmental differences: middle- and high-school students are influenced more by their peers and might ignore (or even rebel against) formal messages, coming from adults.

We see a greet potential for using technology for this population, especially as many social and emotional experiences are already embedded within digital worlds (such as social networking sites) within this age range. Thus, not only are students already fully active within digital world at this age (cf., Boyd's influential book [5]), but are also experiencing situations that could be turned into *teachable moments* and thus promote SE competency development. A substantial design challenge is then how this might be done while paying respect to the privacy of students, the trust they have towards the tools they are using, and the need for their active engagement with content that is needed for the learning to take place.

Conceptual challenges

Drawing on our recent TOCHI review [32], this section takes a more conceptual approach, highlighting the challenges arising from the underlying learning processes that are needed for social-emotional competency development.

Experiential learning key

Developing self-regulation requires repeated practice and students' scaffolded experiential learning within relevant situations to ingrain the learning beyond full cognitive control. This is analogous to how showing someone 'how to ride a bike' will not be helpful unless they can (repeatedly) try it out for themselves. Consequently, *learners need extensive examples and opportunities for personal experience and practice in real-world settings that are coupled with in-the-moment feedback that drives active reflection on progress* [17].

Critical role of scaffolding the learning

While effective, the existing prevention programs are however very resource intensive. The *key challenge is that they lack scaleable techniques to get beyond classroom-based learning and support the in-the-moment reinforcement and scaffolding of the learned self-regulation techniques, that are needed for the skills to be transfered from intervention to practice* [39, 3, 17, 27, 12]. In particular, the critical role of providing this scaffolding and support is currently left to teachers and parents, requiring extensive face-to-face training to do so effectively (e.g., weekly workshop sessions over the period of at least 3 months).

Systems drawing on wearables and other UbiComp components could take over (or complement) this crucial scaffolding role: providing the adults (such as parents/teachers/peers) enough support to help the learners without extensive training; as well as, provide novel in-the-moment facilitation empowering the learners to also reinforce self-regulation compentencies when no adults are present or available. In particular, such technology could aim to support the following aspects (cf., [32]):

(i) help learners identify teachable moments within everyday interactions;

(ii) scaffold reinforcement and learning in these situations, for example in similar ways to how teachers coach children in class;

(iii) 'stop & learn' from such experiences by promoting reflective skills (e.g., making the interpersonal/emotional situations more tangible and available for post-hoc reflection);

(iv) further support the transfer of skills by providing novel spaces for practice that offer a combination of eliciting relevant and strong experiences, but in a safe space where failure is possible and scaffolding is designed into the activity itself; and

(v) expanding the reach of SEL programs in time and space: beyond school hours and beyond school boundaries.

Successful technology support for any of these points could would help to fundamentally re-think the opportunities for SEL intervention delivery more broadly, demonstrating how technology-supported approaches can effectively extend the reach and impact of SEL interventions.

POSSIBLE ROLES FOR TECH

The TOCHI review [32], lists a range of successfully deployed—or potentially deployable—HCI systems in this space. While the presentation was so far structured according to outlining the the key challenges for SEL learning that could be addressed by technology, we can also see across the presented examples broad categories of types of technologies that can be deployed to support different principles. We draw out some of these categories here to illustrate the general classes of technologies that can support SEL. This variety also points to the complexity of the design space and emphasizes that supporting a particular learning principle does not necessarily prescribe a particular role for, or type of, technology.

1. **On-going feedback:** With the rise of wearables and machine learning algorithms, a whole body of research is now focused on developing systems that can sense and automatical interpretat users' behavior, helping them to draw out patterns they were not aware of before. Information can be presented in real-time, such as giving feedback on communication behavior in meetings [18, 10], or over longer periods of time such as in AffectAura [20]. If carefully designed and embedded within the SEL curricula, such data could markedly support in-the-moment training and empower the learners to reinforce and practice key SE competencies as part of their everyday lifes.

2. **Structuring activities:** Other systems aim to provide timely reminders to support users behavior. They may provide data for the user to reflect and act on, but rely much less on automatic sensing and interpretative capabilities of technology, leaving the interpretation to the user. Examples can be found in autism technology such as MOSOCO system [13] listing the appropriate actions the person should take and asking them to rate their performance (i.e., no sensing on the part of the system); personal reflection tools, such as Affect Diary [36] and systems around SenseCam (e.g., [14]; or facilitating keeping of diaries in psychotherapy [19].

3. **Safe spaces for practice:** A third role digital systems could take is to facilitate or create novel experiences allowing for innovative practice. This can be either by providing a 'new world' to behave in, as per (serious) games [15] and virtual reality [4, 31]; or by helping the users to get a novel perception of a particular behavior such as through gamification of real-world experience (e.g., Superbetter app) and the accentuated feedback in systems developed by 2].

4. **Connecting and sharing:** Fourth role was in supporting connecting and sharing among larger groups of users, promoting support and peer learning. For example, facilitating cooperation by reaching out to social support nets (e.g., [24]), the family/friends circle (e.g., [16, 22]), as well as project-based learning approaches.

5. **Rapid improvements:** Current SEL programs are delivered by printed matters and have a refresh cycle of 5 or more years. The developers of these program get very little feedback and therefore the progress rate of these programs is slow. Digital content, on the other hand, can be modified easily. It also makes it easier to collect feedback which allows for rapid update cycles and hence, over time, better content.

EXAMPLE HCI PROJECTS IN THIS SPACE

In this final section, we draw on an interview study [33] with 14 SEL experts (9 developers, 5 trainers, with SEL experience of median 18 and average 20.8 years) from seven established SEL curricula (including Second Step, PATHS, Incredible Years, 4Rs and others). In what follows, we outline three areas that the SEL experts perceived as most promising for technology support, each with a short description of a possible HCI project.

Facilitate practice and learning beyond SEL lesson

Generalization of taught skills to situations beyond the SEL lesson is the core objective of all SEL programs, and a key recurring challenge appearing across all interviews. The social and emotional situations in which students are expected to apply the learnt skills cannot be fully replicated in class. The skills are thus practised in situations that progressively resemble real-world setting, but then need to be reinforced in actual, out-of-class situations (on the playground, at home, in other lessons etc.). Our participants highlighted the potential of wearable and mobile technology to support such out-of-lesson learning, both in terms of providing the in-situ, just-in-time coaching support (as per, e.g., [28]), or in facilitating novel training situations that could reinforce and support the generalization of skills.

Exemplary project: Emotional regulation, e.g., the ability to calm down when stressed or angry, was highlighted by the majority of developers and trainers as the key skill that is required for any other learning to take place. It is however also one of the most difficult skills for the learners to learn and transfer. As one opportunity, the participants in both workshops envisioned how combining a computer game (which can be used to elicit strong emotions) with bio-feedback of bodily stress (providing the just-in-time cues and prompts to trigger the calming down strategies taught by SEL courses)

could provide the learners with valuable novel opportunities for practice. Previous work in other settings, e.g., [4], suggests that such systems could also be effective in SEL. As the strong emotions elicited by a game are naturally felt (as opposed to role-played interactions), the curricula developers hypothesized that such practice would be more likely transfer to other settings.

Provide tools to scaffold parents engagement with SEL

Parents are overwhelmingly understood as the one of the key agents of change by all SEL curricula, especially given the importance that adult modeling of skills plays for young learners. While most curricula have a wealth of content to support the parental role (e.g., in the form of workshops, or paper documents sent home with children), they lack the tools to distribute it effectively and struggle to engage parents to support SEL at home. As exemplified in the project suggestion below, our interviewees were optimistic about the opportunities for mobile technology to support parents' engagement with SEL learning and to scaffold reinforcement of crucial SEL concepts through playful interactions with their children.

Exemplary project: The workshop participants discussed how digital technology could help infuse SEL concepts into everyday parent-child interactions, such as bed-time reading for pre-K to K2 learners, effectively scaffolding reinforcement of SEL curricula in engaging and playful ways. Building on the existing HCI research on facilitating parent-child interaction with technology, such as Family Story Play [30], an interesting design challenge for HCI is exploring the potential that digital technology may offer beyond what can be accomplished with a non-digital book. Our participants were particularly excited about the opportunities of infusing the stories with interactive prompts, cues, and activities that would better scaffold discussions around key SEL concepts for both parent and child. Examples might be a focus on problem solving (e.g., show different story outcomes based on the child's choice), or perspective taking and awareness of emotions (e.g., 'what might Mary feel now?'). Moreover, the curricula developers envisioned that such scaffolded interactions can also be designed to promote the parents coaching abilities around SEL concepts. For example, being able to formulate how one feels is an important aspect of many curricula, but something that parents often struggle to support. The scaffolding designed into the interactive book might make such interaction more accessible even for parents who would otherwise find such topics uncomfortable.

Feedback for curricula developers

While all curricula undergo extensive piloting and rigorous randomized controlled trials to gauge their outcome, they are still mostly distributed in printed form. Once sent out, the curricula developers then do not necessarily get feedback from teachers or parents to provide support for fidelity of deployment, identify aspects of curricula (e.g., specific activities) that are in need of further improvements, or allow for rapid innovation and change (e.g., A/B testing of new activities across schools). Incorporating digital technology could help address all these challenges as well as promote a sense of ownership for the teachers, parents, and learners.

Exemplary project: Although most curricula have documents and activities that are sent to support parent involvement, curricula designers receive very little feedback about whether and how these are used by parents. Our participants were excited about providing the family with a physical object that serves as a portal to an underlying digital content, e.g., a QR link on a fridge magnet or a digital frame. Such an object could then be incorporated into homework exercises, serve as an ambient reminder of SEL concepts (e.g., constantly visible on the fridge door), and also facilitate collecting the needed feedback from the parents and children, or even empowering the users to create and share new content. Moreover, curricula designers could work with dynamic content updates (e.g., a machine learning based tailoring), as well as large scale comparisons of effectiveness of different activities across broad populations.

CONCLUSION

This article points to the potential of mutual cooperation between HCI and social and emotional skills learning (SEL), beginning with education, and benefiting both disciplines. We outlined the key challenges for current SEL approaches, including the lack of support for transfer and embedding of skills from the SEL lessons into students interaction, encouraging parental involvement, as well as enhancing the support for development of reflective abilities and novel environments for practice. The review of the existing HCI research shows there are strong indications that technology could help address many of these challenges. We drew on the existing HCI work in a wide range of areas such as ubiquitous computing, emotional awareness and reflection, sensor-based tracking, social networks, design, and (serious) games. As such, HCI involvement in this space has the potential for strong, real-world impacts, especially given the wide (and ever increasing) penetration of SEL programs in our schools, workplaces, and everyday life. The focus on SEL provides new challenges for HCI, as well as a structure to further guide and support HCI research around social and emotional interactions—both as a test-bed to develop cutting-edge technology in, but also as a knowledge base we can build and learn from as we shape this emerging research area for HCI. Overall, this article suggests that social and emotional learning points to a novel, complex, intriguing research space, which has a high potential to enrich HCI research and practice.

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