Scaffolding the scaffolding: Supporting children’s social-emotional learning at home

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ABSTRACT
The development of strong social and emotional skills is central to personal wellbeing. Increasingly, these skills are being taught in schools through well researched curricula. Social-emotional learning (SEL) curricula are, however, most effective if reinforced by parents, transferring the skills into everyday contexts. Traditional SEL programs have had limited success engaging parents, and we argue that technology might be able to help bridge this school-home divide. Through interviews with SEL experts we identified central design considerations for technology and SEL content: the reliance on experiential learning and the need to scaffold the parents in scaffolding the interaction for their children. This informed the design of a technology probe comprising a magnet card and online SEL activities, deployed in a school and via Mturk. The results provide a nuanced understanding of how technology-based interventions could bridge the school-home gap in real-world settings and support at-home reinforcement of children’s social-emotional skills.

AUTHOR KEYWORDS
Social-emotional skills; SEL; Education.

ACM CLASSIFICATION KEYWORDS
H.5.m. [Information interfaces and presentation]: Miscellaneous.

INTRODUCTION
Social-emotional skills—such as the ability to be aware of own emotions, self-regulate or be empathic to others—are essential to personal wellbeing as well as interpersonal relationships [26, 47]. These skills are increasingly taught in schools across the US and many other countries as part of formal programs [19], drawing on experiential learning methods such as in-class role-plays or coaching (see [43] for a review). Such social-emotional learning (SEL) curricula have been shown to produce positive effects on children’s academic and personal accomplishments in the classroom (cf. [12, 47]) and are already deployed at scale: for example, 44% of US teachers have indicated that their school uses a school-wide SEL program in a representative US survey [6].

Developing social-emotional skills requires a collaboration between the school and home as two of the key social contexts within which SE skills are developed. However, the SEL programs report limited success with engaging parents through traditional means such as face-to-face workshops and sending documents home. A key challenge is then how to support the reinforcement of SEL learning beyond the classroom and in the homes of the learners [34]. Recent work has strongly suggested the potential of digital technology to play a key role in addressing this issue [43, 44], but to date there has been very little research in CSCW, HCI, and related fields that explores the use of technology to link the school and home to support the development or reinforcement of social-emotional skills learning.

To start addressing this gap, the main aim of this work is to explore how technology-based interventions could bridge the school-home barrier in the context of SEL programs; and, once in the home, how technology might support the parents in reinforcing the social-emotional learning of their children. In what follows, we report on a sequence of three studies.

The first study aimed to better understand the difficulties in connecting the classroom and the home and the key aspects that need to be supported for the SEL reinforcement process to take place. We interviewed SEL experts and trainers representing nine major SEL curricula in the US, whose programs together reach more than 35% of all US schools. We identified three key principles that any technology-based intervention would need to support, from the SEL experts’ perspective. These are centred around: (i) the need for experiential engagement with SE concepts for parents and children; (ii) the need for scaffolding the scaffolding for parents: i.e., that children learn through parent-scaffolded activities, but support for parents on how such scaffolding can be done should be designed into the activity; and (iii) the lack of effective delivery channels that bridge the home-school gap. These principles then guided the design of a technology probe (cf., [22]) with the aim to further explore and deepen our understanding of the design space and promising directions.

In the second and third study, we deployed the probe in two different contexts: an in-the-wild study with 4 classrooms (~100 families) at a US school; and a more con-
trolled deployment with 25 parent-child pairs, recruited through MTurk, whose interactions with the probe were recorded. These varied contexts allowed us to collect multi-faceted data, developing an in-depth understanding of how technology-based interventions might bridge the school-home gap in real-world settings; as well as the detailed considerations of how to design interactive content that might support experiential learning and the scaffolding role of the parent.

This paper makes two important contributions. First, we provide insights into the challenges in bridging classroom and home in the context of SEL programs (as seen by the SEL experts) as well the key learning principles that need to be supported for SEL reinforcement to take place in the home. Second, we present a case study of the design and deployment of a technology probe, instantiating these principles, and thus providing empirically grounded design suggestions for technologies supporting parent-child interactions that could reinforce social-emotional skills learning at home. In doing so, this paper contributes to an important but so far under-researched area in CSCW and HCI, with the potential for a large scale, real-world impact.

BACKGROUND

Social and emotional learning in education is a mature field, with 25+ years’ history of peer-reviewed curricula that have already been deployed to millions of pupils [12, 19, 35]. SEL curricula teach a broad range of skills, commonly grouped into a set of 5 core competencies: self-awareness, self-regulation, social awareness, relationship skills, and responsible decision making. The core of most curricula is a set of structured classroom lessons [23], usually 25-40 minutes long and delivered once a week throughout the whole school year (and over multiple years).

Experiential learning as core principle for SEL

Teaching of social-emotional skills is predominantly based on active experiential learning [2, 13, 49], with process similar to the Kolb’s [28] experiential learning cycle. This reflects the understanding that both conscious and non-conscious components are fundamental for any social-emotional behaviour [3]. There are two underlying psychological mechanisms at play (cf., [51]): First is the difference between declarative and procedural memory systems [45]. The declarative system stores what a person consciously knows, such as the names of capital cities, or a memorised sequence of steps to start a computer game. In contrast, procedural memory stores the behaviours as they become progressively automated and thus not necessarily consciously known; such as ‘knowing’ how to ride a bike, or drive a car (cf., Schön [41] for experts’ reliance on procedural knowledge). The second psychological mechanism describes the changes within our cognitive processes in ‘hot’ moments, i.e., situations with high emotional activation, such as when one is in the middle of a heated argument. These cognitive changes reduce the availability of declarative knowledge and strengthen the use of procedural knowledge. As social-emotional skills are tightly interwoven with emotional activation, this mechanism explains why procedural knowledge is fundamental in SE skills learning.

Developing procedural skills requires repeated practice and students’ own experiential learning within ‘hot’ situations. It is for this reason that all social-emotional learning heavily relies on a progression of carefully structured social situations: starting from ‘cold’ moments, such as introducing a series of ‘calming down steps’ that are practised out of context; to ‘warm’ situations such as role-plays or stories enacted with puppets, where the learner is experiencing a low-intensity but still emotional situation; and finally ‘hot’ moments when the learner is coached through a real issue they are experiencing at that moment. In each of these, it is the scaffolded subjective experience with emotional content that makes the social-emotional learning effective; in addition to the cognitive understanding of ‘what one should do’.

The main challenge compared to other experiential learning situations (e.g., physical skills such as riding a bike) is the difficulty in creating situations where meaningful practice or reinforcement can occur. To do so, one needs to facilitate ‘appropriately hot’ experiences for learner as well as scaffold their involvement, as otherwise little is learned. In addition, a crucial pragmatic issue is also that many of the such ‘appropriately hot’ situations require an inherent involvement of others: for example, when learning to self-regulate during conflicts, the learner needs to experience a conflict situation; and thus would normally require other people to role-play (or actually have) a conflict with.

Current SEL challenges – areas in need of design

The requirement of scaffolded experiential learning leads to a number of challenges common across all SEL curricula, which technology support might be particularly well suited to address. However, to date, little or no technology is used as part of SEL curricula. See review by Slovak & Fitzpatrick [43] for more details.

The key identified challenge for SEL is in embedding the learning and reinforcement processes into everyday life, complementing the in-class settings that the SEL curricula are developed for [43]. This points to the potential of technology-based support to help learners: (i) 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); and (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.

These aspects are relevant for all contexts the child is interacting with: e.g., the school, peer interactions, and the home. As will be argued in the next section, embedding the learning within the at-home context was the main immediate challenge perceived by the SEL experts during the interviews (cf., the next section and [44]); and is also mirrored in the SEL literature as one of the crucial issues SEL domains faces [13, 23, 34].
Digitally supported parent-child interaction

Although an emerging body of work shows how digital technologies can scaffold parent-child learning activities (e.g., [29, 30]), these are so far associated with the classical school content such as math or literature, and are thus building mostly on declarative rather than procedural learning processes. In another related area, a number of projects provide basic social skills training for people with autism, mostly as part of the therapeutic treatment (see [26, 39] for reviews); including work looking at involving the patient’s family in the process (e.g., [20]).

More generally, CSCW and HCI have an extended history with supporting parent-child communication, especially when the parent and the child are at remote locations. Existing work has explored how video systems can support parent-child relationships over long distances (e.g., [1, 53]); examined the opportunities of video-based technology to support remote play between children and parents [21] or peers (e.g., [54]); and provided a technology-based support for scaffolded reading of books over distance (e.g., [15, 38]). A number of other projects have explored the potential of technology in co-located contexts: using tabletops to drive engagement and parent-child interaction (see [52] for a review); dialogic reading experiences for children and their parents on tablet based ebooks [27]; sensor-based cooperative games [40]; and enhancing shared play or creative storytelling among children [7].

However, no work so far has explored if and how digital technology can support social-emotional skills reinforcement at home for neuro-typical children.

FORMATIVE STUDY: SEL EXPERTS INTERVIEWS

Building on the theoretical background, we conducted a series of interviews with SEL program experts and trainers from a wide range of nine established SEL curricula; altogether reaching more than 35% US schools. Each of the interviewed experts has been instrumental in developing their respective curricula and brought many years of experience with real-world deployment and evaluation of social-emotional learning curricula. Our aim was to build on this knowledge to identify the immediate key challenges and opportunities where technology could be of use within SEL field.

The issue of supporting parental engagement with SE skills learning and reinforcement at home—as a fundamental opportunity for out-of-classroom practice of children—emerged as one of the core themes from the preliminary analysis (cf. [44]). In what follows, we first describe the broader study design and then focus specifically on the part of the data corpus that unpacks the methods SEL curricula currently use to engage parents; to facilitate situations in which experiential learning can take place; and scaffold the progressive learning in increasingly ‘hot’ situations.

Participants and methods

We recruited 14 SEL experts: 9 curricula developers, and 5 key trainers, representing nine of the major SEL curricula providers to US schools. The experts had a median of 18 and an average of 20.8 years of SEL experience, and were reimbursed $100 for their time. The semi-structured interviews with each expert were conducted in person or over phone (53-75 min long). Each interview was audio recorded, annotated in the software package InqScribe, partially transcribed, and thematically analyzed as per the 6 step process outlined in [5]. The themes covered in the interview included: the participants’ understanding of the challenges the learners, parents, teachers and curricula developers currently face; what they perceive as the key components of their program; what aspects are most difficult to learn or teach; and what are the actual methods they use to teach these. The following discussion focuses on the key challenges identified around bridging from the classroom to the home context and the key aspects of the SEL learning process that need to be supported in the home setting.

Current approaches and challenges

All of our participants’ curricula include a family component, in the form of in-person workshops or materials sent home, which were designed for a wide range of target populations: from all neuro-typical children to at-risk families. The key challenge, as perceived by the SEL experts, was about ways to effectively reach parents and then facilitate the needed experiential engagement with either one of these two methods.

For those parents who choose to engage with the training, workshops were described as an effective way of helping parents support the children’s learning, and a substantial majority of parents were seen as strongly motivated to support their child’s social-emotional development. However, the workshop turn-out rates were reported as often very low. While these improve if child-care is provided and parents’ travel is reimbursed, they are still sub-optimal even under such circumstances. The developers were also pessimistic about the effects of printed materials sent home without the workshop component. Even when the paper homework is actually sent home by the teachers, then “these just do not get read (E1)” by the parents; and also lose the social and interactive quality of the workshops, “becoming more like schoolwork (E11)”.

The SEL experts acknowledged the complex, multifaceted situation around why parents might or might not choose to engage with social-emotional skills learning, such as the possibly difficult relationship or the lack of trust between the school and parents, especially in lower socio-economic areas. However, they believed that a key difficulty for majority of the parents rests in the general ‘busy-ness’ of their lives: the ever-present lack of time; too many materials coming from school to keep track of; and, for the case of workshops, the pragmatic issues around a scheduled fixed time, need to travel, and other commitments.

Overall, the interviews suggested a need for another method that would combine the benefits both of the workshops (facilitate active, experiential learning) and materials sent home (low barriers to involvement).

Supporting experiential learning in workshops

This section outlines the aspects that the participants see as fundamental in making the workshop training effective; and
the lack of which limits the benefits of existing materials sent home. These are useful to identify the core aspects that would need to be supported by the technology.

According to the SEL experts, one of the key roles for parents in supporting their child’s SE development is to either facilitate the appropriate experiential learning context for the child; or to skillfully take advantage of naturally occurring ‘teachable moments’, such as the child having to deal with the frustration of doing the dishes, not understanding homework, or having to go to bed. Such moments are plentiful in everyday settings and can provide the best reinforcement for children’s skills. However, the SEL experts were concerned that many parents might lack the ability to provide the needed coaching and scaffolding effectively; and that these are also the families that might benefit from SEL most (cf., also [17,25,49,50]). As E6 pointed, “the greatest challenge is that adults [often] do not understand social-emotional learning; they cannot break it down for their kids”. In particular, although the parents “think they are helping the child solve the [social-emotional] problem, they are actually giving them the answer (E3)”, creating a dependency rather than coaching the child to develop a new skill. Moreover, many social-emotional skills bring up topics that some parents might not be used to discussing directly and might not know how to address.

In response to these concerns, the workshops strive to help parents to learn how to scaffold learning for their children. Parents are provided with example questions they can ask (as part of the paper-homework), practise such situations through role-plays, and are encouraged to use on-going reinforcement techniques such as a stable vocabulary for specific situations (e.g., calming down steps). The resulting scaffolding of parent-child interaction is then closely aligned with Motion Coaching framework by Gottman and colleagues (e.g., [16,17,25]). Important aspects include inquiring about and validating emotional experiences of the child, helping him or her label what they are feeling, providing empathic support when needed (e.g., through the progression of questions), and promoting the child’s agency.

**DESIGNING TO SUPPORT PARENTAL ENGAGEMENT**

The background literature and the expert interviews provide a theoretical basis to design technology in support of parental engagement and at-home reinforcement. Social-emotional learning fundamentally relies on experiential learning to develop procedural knowledge. Supporting such learning thus must elicit the ‘right’ social-emotional experiences for the learner, and offer the required scaffolding to learn from the experience. Moreover, the closer such learning is to real-world situations, emotions, and experiences (i.e., actual ‘hot’ moments), the higher the chance that the learning will successfully generalise to everyday settings. For example, learning how to help characters in a game to calm down is not going to be successful unless the child is additionally supported in experiencing or recalling an angry state (e.g., through role-play), and then helped in applying the techniques herself when she genuinely feels mad.

In the case of supporting parental involvement, this theory (and the best-practices shared by the SEL experts) translates to three key-practices and corresponding research questions for technology support in this space:

**RQ1** How can technology provide a suitable delivery channel to effectively bridge classroom learning and at-home reinforcement by parents?

**RQ2** Assuming it reaches the parents, how can technology experientially engage parents and children with the SEL concepts (as the workshops do) rather than just presenting them with ‘dead’, non-interactive information (as per the paper homeworks)?

**RQ3** Finally, how can technology provide the scaffolding for the scaffolding role of the parent, who needs to carefully balance the nature and ‘hotness’ of the experience for the child, while offering direct support only when necessary?

Moreover, the underlying aim of the SEL technology should be similar to that of the workshops: to ‘teach and disappear’. That is, technology should help scaffold the learning and reinforcement of skills during a limited period of time, so that the newly learned skills will persist also after the technology is taken away or just not used anymore (i.e., are not dependent on such technology support being continuously present).

**TECHNOLOGY PROBE DESIGN**

To start exploring design solutions to the research questions outlined above, we developed a ‘technology probe’ (cf., [22]). A technology probe is simple technology that is deployed in real-world settings with the aim to collect information about use and appropriation, and to inspire further design ideas. Such a methodology is well-suited to the research questions at hand, where the in-situ appropriation of the technology by parents, children, and teachers, forms a fundamental part of the challenge.

Our aim was thus to create a probe that could be also deployed in ecologically valid, real-world settings of a public K8 school, helping us identify promising mechanisms to promote parental involvement. We developed the probe in close collaboration with the SEL developers and researchers at Committee for Children—the developers of Second Step, the most widely used SEL curriculum in USA—who provided the team with key SEL expertise. This included access to all Second Step curricula materials and weekly design meetings.

The resulting probe comprises a 8.5 x 3.5 inch magnetic sheet (see Figure 1), that links the users to a series of online activities (more information below), accessed through a web-page interface. We chose a simple web-based solution to easily cater to all operating systems across desktop, mobile phones and tablets. The magnets were designed to be distributed to children by their class teachers, together with a simple story (‘Hardy needs your help to find the treasure’) to pique the children’s interest.

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1K8 school is a school that includes Kindergarten and Grades 1 to 8, i.e., approximately ages 5-13.
Direct parent-child interaction. To scaffold this, we interjected also created a shared experience and set the scene for a more efficiently strong emotions for them to relate to. To promote the parental involvement and support, the story we chose to have the questions addressed to the child and to be read aloud by the adult. The aim was to create a sense of interdependency between the child and adult, as many children are not likely to read fluently at this age. As such, the written text nudges the parent to take the narrator role and to probe into the emotional states of the character; he or she is also scaffolded in helping their child do so through the carefully selected questions.

Moreover, as the story progresses, the prompts are increasingly taking the parent-child interaction from the story to real-world activities between parent and child: they are asked to first explain the Calming Steps that the child learned at school to Harrdy (and, implicitly, the parent), help Harrdy practice one or more calming down strategies (deep breathing, counting down, and positive self-talk), and eventually to role-play the situation themselves (“Harrdy needs to see another example... how about your adult plays out what happened to Harrdy and you help them calm down?”).

Finally, repeated practice—using the associated calming down steps vocabulary serving as triggers—is crucial for reinforcement of self-regulation. To explore if and how the probe could support such repeated engagement, we designed the story as a sequence of related sub-stories, with the initial activity ending on a cliff-hanger: the monkey runs away with pieces of the map and Harrdy sets out to find it. The child is then asked to return to the activity the next day to help him. Over three follow-up encounters, each practising one of the three calming down strategies, the child is helping Harrdy find the map pieces and, eventually, the treasure.

Designing the delivery channel

The delivery channel design accounts for the three key stakeholders in this context: the teacher (who distributes the activity); the parents; and the children. Appreciating the interview and literature findings about both parents’ and teachers’ busy life schedules, the distribution needs to (i) be simple and quick to distribute in class and engage with at home; (ii) stand out from the stream of other school-home messages the parents are already over-burdened by; and (iii) be pragmatically easy to build and deploy so that it can serve the data collection role on the scale of multiple classrooms (26-28 children each).

The design of the probe drew on a ‘portal’ metaphor: the probe was designed as a simple physical object—a magnetic card—that is sent home with the child together with other school-home documents. When engaged with, however, it then serves as a virtual portal to the online activities. Mag-
nets were selected as a ‘known’ object tapping into the common family practices around putting things on a fridge in the US; aiming to hopefully serve as an ongoing reminder and a stable link to the dynamically changing activities over time. Using a magnetic card, rather than a standard sheet of paper, also provided us with the option of sending home something possibly of ‘perceived value’ that might not be thrown away immediately after first use.

The probe was designed to utilise the child’s motivation to play the activity as the key method of also engaging the parents. To this end, we framed the activity as a ‘treasure hunt’, hidden within the card, that they need to discover together with their parents. Our design rests on the assumption that the combination of the mystique of a magnet ‘hiding a story’ together with a likeable design would make the child an active participant in persuading the parent to engage with the activity; as opposed to a math homework, or the usual paper SEL homework exercise.

Finally, we needed to design for the conflicting needs of privacy considerations on the one side and the data collection functionality of the technology probe on the other. Each card has a unique ‘secret code’ that allows us to track interactions from each card. The secret codes also came in ‘packs’, one per each class, allowing us to track usage on the class level as well. However, as the system collected no personal information and the teachers were asked to randomly distribute cards to children in class, neither us nor the teacher were able to ascertain which secret code belongs to which family.

STUDIES WITH THE PROBE - OVERVIEW

The probe deployments aimed to answer multiple questions: First, test the delivery channel aspect, where the interest is in natural uptake of the probe and understanding if and how this (and similar) technology can fit into teachers’ and parents’ existing practices (RQ1). Second, analyse if and how the designed content experientially engages parents and children (RQ2), and whether it provides sufficient scaffolding for the scaffolding role of the parent (RQ3).

To explore these issues, we deployed the probe in two different contexts: First, we recruited four classrooms in a K8 school in a major US city, in which the magnets were sent home with kids in four classrooms. This allowed us to understand the in-situ uptake within the everyday settings of teachers, parents, and children (RQ1). The ecological validity of such in-the-wild deployment came at the expense of limited opportunities to observe the parent-child interactions directly (as that would affect the natural uptake). Second, we thus complemented the first study by recruiting 25 parent-child pairs on MTurk, who have consented to screen-recording their interactions with the activity. This provided us with detailed information about the parent-child interactions around the activity that were needed to analyse RQ2 and RQ3. We report on each of the deployments individually and combine what we have learned in the Discussion section.

STUDY 1: IN-THE-WILD DEPLOYMENT

The aim of the first probe deployment was to study the uptake within real-world classes and families. We aimed to understand if and how similar technology could serve as an engaging delivery channel, and how to design for a best fit with (or positive change of) teachers’ and parents’ existing practices.

Methodology

Participants

We recruited a school counsellor and 4 classroom teachers in a K8 school who had taught Second Step over multiple years already. To explore the effect of age, each of the recruited teachers taught at a different grade level: Kindergarten, Grade 1, Grade 2, and Grade 3. As part of our recruitment, we offered a $50 reimbursement each for the teachers and the counsellor to compensate the organisational overhead and the time spent with us on a (post-deployment) interview. Every child in each of the four classes received their own magnet card to take home to their family.

Methods and data collected

The packets of magnets (one pack per class) were sent to the school counsellor, who distributed them to teachers. The packets included a simple Parent Letter to be sent home with the magnet, and an information sheet for the teachers outlining the distribution of cards: they should hand out the cards to the class and tell a simple scripted story. Importantly, the magnet was not framed as homework, but as an optional extra-curricular activity.

Our server logged all interactions with the activity from any of the cards individually, using the ‘secret code’ on each card as the identifying information. This allowed us to collect de-personalised information about the usage, separated into the individual classrooms. In addition, we asked teachers and the counsellor for a 30 minute interview, several days after the cards were sent home (5 interviews, overall 131 minutes of recordings); and also had the opportunity to interview some of the children (post-deployment) about their experiences, for 40-45 minutes per class. Depending on the age range, we interviewed groups of 3-6 children, with one or two groups per class (27 children altogether).

The nature of the deployment made it impossible to directly recruit parents or offer rewards for participation before the deployment as this would alter the natural uptake. We however attempted to elicit feedback from parents in three alternative ways: At the end of the activity—i.e., the parents must have engaged with it already—the parents were asked to rate the activity via two sliders, namely ‘perceived usefulness’ and ‘child enjoyment’. At this point, we also invited the parents to take part in a 10-15 min phone or Skype call, offering a $10 Amazon voucher in appreciation of their participation. Finally, the teachers invited the parents (through email) to participate in a 5 min online survey two to three weeks after deployment, connected to a $40 raffle prize.

Deployment results

Activity logs – at-home engagement

The lack of delivery channels to effectively engage parents with SEL content is one of key issue we identified in the literature and interviews (RQ1). A fundamental question of the first deployment was whether the activity would reach parents
First, we explored the activity usage aiming to understand the extent of involvement for individual cards. The main indicators of interest were whether the family logged-on at least once, if they finished the first activity, and if they repeatedly returned to the card to continue the story. An overview of the results is in Table 1. Overall, our data shows that between 46% to 60% of distributed cards have been used in individual classes, and a large percentage of those who started have finished at least the first activity (57% to 87%). Putting this in context, the teacher’s interviews (cf., next section) suggest that reaching initial engagement levels of 50% can be considered a success. A much smaller proportion of families returned to the activity for follow-up stories; the teachers’ interviews indicate that one possible contributing factor is that the option to continue the story was not clear to some participants. Note that the logged data does not contain information about whether the cards were used with a parent, sibling, or alone. The interviews with children and the school counsellor however suggest that a large proportion of parents did know about and engaged with the card (see below).

Second, we looked at the ratings data submitted by families immediately after finishing the first activity. Out of the families that reached this point, 59.6% submitted a rating. Both ‘perceived usefulness’ (mean 86.9, SD 18.0) and ‘child engagement’ (mean 76.4, SD 22.4) were rated relatively high on the scale from 0 of 100. Only 4 people indicated a rating lower than the neutral point (50/100) on either of the scales. Overall, this suggests that, at least those who rated, have both enjoyed the activity as well as found it relatively useful.

**Fitting into teacher’s practices**

Teachers play an important role in any delivery channel trying to bridge school and at-home learning. To better understand how the probe (and similar technologies) could fit into the school context, we inquired about the methods the teachers use to connect and engage with parents at the moment, their opinions on the activity as a learning tool, and what they would consider as success in terms of parental engagement with the probe.²

All teachers valued thinking about ways of engaging the parents with SEL (as well as other subjects), especially as a preventive measure: “Ideally we would involve parents more. It is so far with the parents of kids who have [behavioural problems and then we have these conversations [...] but ideally, you would give these strategies pre-emptively (T2).” In particular, involving the parents with at-home learning was seen as a general problem: when sending anything home, “we get around 50% for anything that requires an adult (T1)”. Getting to higher engagement ratios then seemed to require substantial ‘bugging work’ on the part of the teachers, such as sending the information repeatedly through multiple channels (such as emails, newsletter and printouts) or requiring the child to collect a signature from the parents. The teachers were also particularly pessimistic about the ratio of parents who would already know about the Calming Down strategies (or other SEL content) as “they probably read it in the newsletter [a few months back], and forgot about it. (T3)”. In terms of engagement rates for the probe activity, all teachers mentioned that 50% parents engaging with the probe would be something they consider a success, especially as it is framed as a voluntary activity. The biggest concern for most teachers was keeping a level field for all the students: a common worry was that through the use of technology we might be “cutting away a bunch of kids who do not have access to internet (T1)”. However, the teachers were willing to work on accessibility issues—for example, by giving such students the option to finish such activities in the library—due to their strong motivation to better connect to as many parents as possible.

When asked to tell us how they handed out the cards, it became apparent that all teachers went beyond the deployment instructions. Instead of just reading the scripted story as suggested, they all used their card to show children a part of the activity; aiming to get the children more engaged and excited. Three teachers showed at least a first few minutes of the video; while the kindergarten teacher went through the whole first activity, utilising it as a teaching resource to reinforce the calming down steps. In all classes, the teachers reported that children were mostly enthusiastic about the cards and were looking forward to taking them home.

We asked the teachers to go through the first activity as part of the interview with us, watching their reactions and comments. In spite of explicit request for critical comments, the activity elicited mostly positive responses, with the critique focussing on localised aspects (such as a specific wording, or a typo in the text) and pointing out that the mechanism for the follow-up stories has not been clear enough. The interactive nature of the parent-child interaction with the story, and the scaffolding of the experience for both child and the parent were points that teachers repeatedly mentioned as particularly important.

**Children’s experiences**

Two of the authors facilitated the child interviews together. We structured the child groups around watching the activity on a tablet, using it as a reminder to elicit stories about their experiences at home. We were particularly interested in who they played it with, which parts they liked/disliked, and what they would suggest as improvements. We were not permitted to record the conversations so one of the researchers kept notes.

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²At the time of the interview, the teachers have just sent the cards home, but did not know if and how many parents might engage with the activity.
Most of the children, regardless of the age, talked about the enjoyment of receiving something physical that was linked to a digital game. The need for parental involvement was also often seen as positive; for example, one child explained how she “liked the activity] because you get alone time with your parents (C8)”. When watching the activity with us, we often observed that the children huddled together around the tablet, enjoyed the ‘goofy’ animation, and repeated some of the characteristic sounds of individual characters (e.g., the Pirate’s ”Arrrgh”). They particularly enjoyed ‘helping Harvy’ by doing the calming strategies (many recalled trying all three strategies when doing the activity at home).

When talking about their at-home experiences, most of the children said they did the activity with another person and that they enjoyed playing it. Surprisingly, the other person was not necessarily a parent: approximately a third of the children shared they played the activity with their sibling instead (either older or younger), often because their parents were away or too busy. Some of the older kids even took over the ‘parental’ role during such occasions: For example, C11 explained how she “first played it with her mum […] but then also pretended to be an adult for her younger sister”. Others started alone but then included their siblings or parent when the social interaction was required. In contrast, two children from the younger end of the age range told us they went through the activity alone. They were often interested mainly in the Pirate story and did not partake in any of the off-screen activities; leading to disappointment with the game. For example, one of the kindergarten children told us that although his nanny was in the room, he has “played through it myself just clicking through all the buttons as I didn’t need to read that. A boring game (C2)”. Some of the children also mentioned technical issues they experienced that prevented them, at least initially, from playing. These were often resolved with the help from their parents or siblings.

Parental qualitative feedback
While the system indicates that 56 cards were used at least once, only very few parents volunteered to take part in the interview or submit a survey: Only one mother signed up for the phone interview and we received only 13 responses to the survey.

Initially, we assumed that perhaps the reason for such low turn-out was that many parents might not know about the cards at all. To test this, the school counsellor offered to intercept parents in-person when they came to pick up their children after school, over a period of 3 days. She was however able to give out only 4 cards, with most of the other parents saying they have seen the card and often already played it with their child; suggesting the probe indeed reached many parents. However, these efforts did not lead to any increase in interview volunteers or survey responses. This suggests that while many parents did engage with the probe itself at home, we did not manage to incentivise them to provide additional feedback to the research team.

The one mother who volunteered was very positive about her experience of the probe; although this is likely affected by the self-selection bias. Her son, who has impulsivity and other behaviour issues, brought the card home and initiated the use. She was surprised he was patient with the story, and had liked the activity. She herself felt that the activity was a good reminder to her to reinforce the calming down skills; she also referred to the pirate story in the following days, saying things like “What would the pirate do now to calm down?”. She particularly liked having a concrete reference for her young son that was tied to a shared story. She did not realise that she could return to the activity over the following days.

The majority of the available survey responses came from parents of the kindergarten class (10 out of 13), with the remaining responses being two G1 parents and one G2 parent. Eleven of the thirteen parents said they played the activity with their child; one did not know about the activity at all; and one did not have time. Apart from a single family, all children were perceived by the parents as liking the activity and enthusiastic to try it out. Six of the parents told us the magnet is still visible in their home, mostly on their fridge; others either did not know or had thrown it away already.

STUDY 2: MTURK DEPLOYMENT
The second probe deployment aimed to address the remaining two research questions, unpacking if and how the probe would facilitate emotional experiences (RQ2) and help parents scaffold the appropriate experiential learning context for the children (RQ3).

We used MTurk to recruit 25 parent-child pairs who would be willing to have their interaction with the activity recorded (thus providing the detailed data needed for analysis), and also were more likely to report their experiences in a post-hoc survey. In doing so, we draw on the growing body of work showing the possible insights gained from MTurk collected data, both at CSCW [31, 32] as well as in other disciplines such as psychology (e.g., [33]). An additional advantage of MTurk recruitment was the possibility to also reach low-income parents and those living outside of principal cities, who are the key at-risk populations for many SEL curricula, but are often hard to reach through other methods.

Methods and data collected
To promote a wide uptake, we offered $5 for the 20 minute long Human Intelligence Task (HIT), placing the HIT among the higher paid end of MTurk jobs. We thus hoped to attract also parents who are not personally interested in the topic of calming down/SEL skills or parenting as such. To improve chances of high quality results, we required that turkers have at least 95% prior approval history, live in the US, and have at least 50 prior accepted HITs [36].

The HIT description asked the participants to ‘play an education activity with your child and tell us what you thought about it.’ We made it clear from the start that the study was to be completed with their child, aged 5-9. Turkers were also informed that they would need to download a third party application (UserZoom) onto their smart-phone to record their

3The parent told us that “although initially very excited to it, my child thought it was not very interesting”.
phone screen, what they say, and the camera image. For technical reasons, we required that participants had access to an Android phone.

During the HIT, participants went through the first Harrdy activity together with their child (task 1), and then were asked to answer questions about their experience such as what they liked or disliked; what other SE skills they consider important, and how are they working on these with their child (task 2). After we reviewed the HIT, all accepted participants were invited to take part in a follow-up survey (8min), reusing the open-ended questions sent to in-school parents. The survey completion was compensated by a further $2 bonus.

Participants
The MTurk recruitment resulted in a diverse set of 25 participants, living across 14 different US states. They reported relatively low-income: nearly half (47%) reported yearly household income as 30k to 50k; and nearly an additional fifth (17%) reported yearly income under 30k. The participants lived mostly often in rural areas (42%), or in metropolitan areas but outside of principal cities (33%). We saw a quite consistent split of grades between Kindergarten and Grade 3, and a single Grade 4 participant. Approximately 80% of parents were mothers. Most of our participants were Caucasian parents; this strong under-representation of Afro-American and Spanish population in the US mirrors results of [33].

Data quality
Overall, we found the data quality very good, with no obvious cheating (e.g., only clicking through or faking the interaction). Due to technical issues with participants’ phones or internet connection, only 17 videos of the pirate activity have been uploaded to the server. These recordings were 8:01 minutes long on average (min 5:06, max 9:56 minutes). For additional 3 parent-child pairs, we had at least the uploaded video of the task 2; leaving 5 parent-child pairs with no video. In these cases, we initially rejected the work, but left the opportunity for the parent to contact us if they thought the rejection was in error. All but one got back in touch and their HIT was subsequently accepted. These participants were then asked to at least fill out the follow-up survey. From the full sample of 25 accepted participants, 19 filled out the follow-up survey.

Data analysis
Our key focus was on the parent-child interactions elicited by the probe. We drew on Gottman et al. [16, 17] Emotion Coaching framework to theoretically ground the key indicators of parental scaffolding. These included, for example: if and how the parent scaffolds the child to become aware and verbalise their emotion during parent-child interactions around the prompts offered by the activity; whether they follow-up on such prompts to validate (and further probe into) child’s feelings; and if and how the parent attempted to scaffold the learning experience for the child more broadly, e.g., subtly helping the child if the child seems lost or helping to rekindle interest if the child loses focus.

We also looked at indicators of the engagement of the child (and parent) with the activity, such as whether they kept focus on the screen or reacted to the story in non-verbal ways (e.g., giggling or mimicking sounds or activities on screen). We annotated the collected videos within the UserZoom interface, both through marking important moments and sub-clips directly within the video. The resulting observation notes were then thematically analysed (methodology as per Study 1) together with the follow-up survey data.

Results
Most children and adults seemed focussed and engaged when watching the initial video and working with prompts. In particular, we saw children sitting still or pointing out things to parents such as ‘look, there’s Harrdy!’ or ‘O-oh!’ when the monkey snatched the map. We also saw a lot of giggling at the animation (mirroring the child interviews in schools), and quick glimpses at the parent to see if they were also enjoying the story. Children’s and parents’ behaviour towards the prompts differed across families, but mostly with respect to age. Many of the older children took pride in trying to read the text out loud by themselves, with subtle support from the parent if they got stuck on a word or read something incorrectly. The younger children were more reliant on the parent reading and scaffolding the interaction with prompts.

We saw clear differences between parents around how they scaffolded the engagement with activity for their child through their reading style. For example, some parents immediately started using a ‘story voice’ to narrate the story to the child, facilitating the child’s interest and involvement in the activity. In contrast, another group of parents started off reading the text in a flat way. These parents left pauses for children’s responses, but only rarely followed-up with additional questions, leading to interactions that appeared much less engaged, and more like homework. Pragmatically, the reading style also seemed to depend on the adult comfort with reading-out-loud – if they struggled with the words themselves, it was harder for them to present the content in an engaging way immediately.

Most of the relevant scaffolding behaviours however appeared when parents and children shifted the attention from the screen to each other, transforming the activity into a joint discussion around the prompt. For example, we often saw the parents read the prompt out-loud (as if making sense of it for themselves), but then immediately turn to the child and repeat the question again in a more direct way. For example, the adult (M14) was reading out loud “Did you ever have something taken away from you? How did that make you feel? Tell your adult. <turning to the child> So tell me, how did that make you feel when someone took something from you?”. Many parents seemed to do this naturally from the start; others took longer to switch from storytelling mode of reading out prompts to directly scaffolding the discussion with their child; but a few never made the switch and read throughout the activity.

What seemed to particularly help parents turn from story-reading to scaffolding their child’s thinking about emotions were the prompts asking for the child’s own experiences
Another source of experiential engagement for the children was enacting the calming down strategies themselves to help Harrdy (or their adult) to calm down. Approximately half of the families went through more than one strategy, often all three. Part of the enjoyment seemed to arise from the funny pirate voice accompanying the strategies, but also from using their own body in response to the game. The adult calming prompt seemed as an enjoyable experience (when adults played along, as the majority of them did); and a number of parents skillfully supported their child in going through all the activities again: e.g., “I breathe and breathe, but I'm still really mad! (M9)”. 

Some parents also repeatedly took advantage and creatively built on the prompts to further strengthen the connections between the story and life. For example, when M18 and her daughter finished the calming down strategy she said: “<turning to face her daughter> So when he’s really angry—or when you’re really angry—you can breathe, right, to calm yourself down. Or you can count from ten...”. Similarly, one of the questions in task 2 asked parents ‘what other skills would they like their child to develop’. Interestingly, this question was also appropriated by a number of parents as a teaching moment: they often started answering the question as if talking to the camera (“I would like my child to become better at ...”), but then quickly turned towards their child addressed the request directly to him or her (“you see, I’d really like you to ...”). It seemed that, again, the indirectness and connection to the story seemed to create a context in which such requests could be made. 

Finally, we saw in the MTurk videos that it was often the parents who were driving the participation of the child; understandably so, as the child had not heard about Harrdy or the activity before. Sometimes, they had obviously initially struggled to get to child to come and watch the activity; although, once the video started, children were often captivated.

**Follow-up survey data**

The follow-up survey included open-ended questions around the experience with the activity (e.g., “What particularly stood out for you about the activity, if anything?”), as well as explicit prompts to identify what they did not like or would like to change. There were two problem areas that some parents pointed to: first were technical issues such as the slow loading speed of videos or the recording software for parents on slow network connections (4 parents); second, some parents felt disappointed they haven’t seen the full story as the three follow-up stories were not included in the MTurk deployment (5 parents).

Overall, the choice of the topic — calming down strategies — spoke positively to many parents. Importantly, many parents highlighted how the cartoon story kept the child engaged, but also how it presented an example situation they could well relate to. For example, M5 wrote “What stood out for me was the way the activity engaged my child and got her to think about why the character was feeling certain emotions, and apply that to herself in certain situations.”

Surprisingly, three parents also mentioned in the time between finishing the activity and answering the survey (~1 or 2 days) either they or their child had already used the strategies in other situations: one parent wrote how she “suggested to breathe like the pirate” when her daughter was upset about her bedtime, helping her calm down; another remarked how her son reminded her to stay calm and breathe when she was going through an unsettling experience; and finally the third shared a story of her younger son, B, instructing his brother to “... B walked over there and in a calm, therapist like voice said 'You know E, you can take big deep breaths and count to ten and that will help you to not be mad.'” The majority of our MTurk child participants did not know the strategies in advance; however, two children did, which came as a positive surprise for their parents — supporting the assumptions that many parents are not aware whether and which SE strategies their child is learning at school.

While such positive responses to the survey corroborate the observations from the videos, it should be kept in mind that both are likely affected by self-selection bias (as parents voluntarily chose to be part of the study); thus providing a relevant, but likely overly positive sample of how the activity would be perceived by broader population.

**DISCUSSION**

The results of the probe deployments provide the first steps towards addressing a key challenge for social-emotional learning (SEL) curricula: bridging the gap between classroom learning and at-home reinforcement of skills. True to the nature of technology probes, this work serves more to highlight the potential of technology in a novel design space (and avenues for future work) rather than to present a full solution. For example, the methodology of current deployments focussed on understanding the uptake of the probe and how the parent-child experiential interaction processes could be scaffolded; rather than evaluation of learning outcomes achieved by this specific prototype per se.

In what follows, we unpack what we learned about design approaches to address the three key constraints: providing an effective delivery channel (RQ1), facilitating experiential engagement with the activity (RQ2), and scaffolding of the parental supporting role (RQ3). We then take a step back and reflect on limitations of this study in the broader context of using technology in support of SEL.

**Suitability of delivery channel (RQ1)**

The literature review and expert interviews show that SEL curricula lack ways to actively engage parents (and children)
with experiential learning at home. The logged data from the in-the-wild probe deployment suggests that the probe was reasonably successful in getting into the homes; engaging 46% to 60% of learners. However, the low parent feedback rate within this deployment complicates our understanding of how exactly the card was used by parents (and the child) in the home setting. Still, the interviews with children and the school-counsellor would suggest that a large proportion of parents have seen and played the magnet (~ 2 thirds of children from our sample); and that only a few children played the activity alone (two children from our sample). Moreover, the MTurk data suggests that at least the MTurk parents engaged with, and scaffolded the learning for their children (see also below) while playing the activity.

Overall, this would suggest that the two main design concepts used by the probe point to promising avenues for future work. First, drawing on the ‘portal’ metaphor, i.e., combining a physical object that is sent home and linked to digital content, seems to fit well established practices around home-school communication; is easy to distribute for teachers; and was understandable to teachers, children, and (we assume) also parents. At the same time, such portals could plausibly deliver a wide range of interactive interventions that build on digital devices already available in homes of the families. Second, relying on the child’s motivation to try the activity—while requiring parental support to do so—seems a plausible method of driving initial parental involvement (e.g., that the parents make a conscious decision whether to engage or not). In particular, giving children a game ‘hidden’ in a physical object that they can try only when they are back at home, seems to have elicited engagement and motivation across the age ranges we looked at (K-G3).

Interviews with children have shown that approximately a third of the learners in the in-the-wild study played the game with their sibling (as the parent was either away or busy). This points to an alternative option of engaging the learners at home: by involving siblings or other family members—rather than just the parents—into the activity as active participants. One opportunity for future work might be designing activities where children work with their (older) sibling to create something, e.g., a story, which is then shown and explained to the parent (still as part of the activity).

The probe was also designed to serve as an ambient reminder that stays visible in the family environment over time, as a magnetic card on the fridge or other places. The SEL theory suggests that providing such on-going reminders is crucial for reinforcement processes. However, we have only limited data on whether this has been successful in this trial. From the 13 completed survey responses, just under half of the cards were still posted on the fridge two to three weeks after the deployment. Though these numbers are somewhat promising, it is unclear what happened with the magnet in the families who did not respond to the survey. An important open question is then to understand how one might design for such long-term ambient reminders in the context of SEL and families (cf., also [37] or [9, p.287] for examples of related CSCW and HCI work in this space).

**Experiential learning (RQ2)**

The theory of social-emotional learning is clear that experiential learning situations are needed for meaningful practice and reinforcement to occur. The results of the probe deployments suggest the combination of a video and embedded prompts can create experiential situations similar to the role plays or puppet stories in class, in spite the lack of trained guidance normally provided by the teacher. In particular, we used a common SEL progression to present a story relevant to the reinforced SEL concept (‘get angry when something is taken away from you’), utilise prompting questions to support the child’s recall of a related personal experience (‘how would you feel’) and help them imagine the character’s feelings, and then looping it back into the story progress with the strategies taught as part of SEL training. This is a promising first step which suggests that a wider range of SEL learning activities could be delivered in a similar manner. However, the child’s experience has been still limited to the tight coupling with the presented story itself, rather than a real-life ‘hot’ situation he or she is experiencing: the fundamental goal of SEL reinforcement.

The key next step for future systems is then to find way to extend the support for the parent and child beyond the video activity itself, helping them connect the strategies to their everyday ‘hot’ moments. The parent interview and MTurk surveys showed that four parents have already appropriated the existing activity in similar way, using a reference to the story to label the on-going situation and remind about available strategies. SEL theory suggests such behaviours are likely to help the child generalise learned skills into other everyday contexts. While this again shows promise in the potential of technology-based delivery to promote such on-going engagement, the open question is how to specifically facilitate such transfer through design. For example, what are the opportunities for ‘smart’ objects that could be delivered home together with the magnetic card, such as a ‘calming down token’ or an ‘anti-anger wand’, helping the child connect the learning with their everyday interactions? And, what might be the best developmentally appropriate metaphors to build on, similar to the ‘treasure hunt’ trope used in the current probe?

**Scaffolding of parental scaffolding (RQ3)**

The second crucial enabling component within the SE learning theory is the skillful scaffolding provided to the child by the adult, in this case the parent. The probe deployment suggests that designing for interdependence between the child and the adult as part of the activity seems like a promising direction to facilitate a part of such parental scaffolding: supporting the parent’s active engagement with child’s activity. In our case, such interdependence created a shared experience for the child and parent that could be then worked with, e.g., through the prompts suggested by the activity. While the current probe only scratched surface of designing for interdependence—through expecting the adult to narrate the story—it points to a wide range of opportunities for future systems (e.g., using multiple devices to drive a single story).

The aim of the carefully selected prompts has been to model Emotion Coaching-like interaction on part of the parent: ask-
ing for and validating emotional experiences of the child including labelling of emotion, providing support when needed (e.g., through the progression of questions), and promoting agency and emotional reflection on part of the child. The analysis of the MTurk videos suggests that this approach is promising. We saw that the most engaging and well-scaffolded interactions happened when parents and children turned away from the screen, building on the shared experience provided by the activity to have a dialog with each other. In such instances, the parents used the pre-prepared prompts as an opportunity to be elaborated on: either by asking the child for more detail about their experiences, or by bringing in their own agenda (such as strengthening the connections between what is learned within the story and real-life use). This opens questions around the methods to scaffold the parental role in a way that is not too tightly bound to the story/activity itself, but rather designed to help the parent to use the story and the embedded prompts as examples that can creatively appropriated to scaffold interactions ‘outside of the phone’.

Limitations and novel design opportunities
The series of studies reported here form a first important step into this design space. We now point to several open questions that have not been addressed here and that invite follow-up work.

SEL expert vs. parent perspectives
The work has been so far focused mainly on understanding the SEL expert perspective: starting from identifying challenges address-able by technology; to designing a system that complements existing curricula and fits with what the SEL experts consider to be best-practices in the field. This provided us with the opportunity to directly work with key experts who have many years experience in developing SEL curricula used by millions of students and to directly draw on the existing SEL literature and theory, which is mostly curricula focussed.

However, such expert-centric approach needs to be complemented by in-depth participatory research with parents to validate if and how their perspective matches that of SEL experts. In particular, future work should aim to more deeply understand the key reasons behind some parents’ existing lack of engagement with SEL. The SEL literature—and interviews with SEL experts and teachers here—would suggest that one of the key reasons is the lack of time (and overload with school materials). The full issue is however likely to be more complex and might depend on cultural background, socio-economic status, and multiple other aspects. More thus needs to be learned about the existing practices of how families communicate around SEL at home (and with school); the underlying parental beliefs and motivation; and the support that parents already provide their children around SE skills. Drawing on the longitudinal work by Gottman’s et al. [17] can be a good starting point to understand what is known about parenting in these aspects, but should be complemented with established participatory methods within HCI.

Complex ethical space
Designing social-emotional learning interventions, whether at home or school, form a complex ethical space. By scoping the research as based on SEL experts perspective and curricula, this paper has side-stepped a number of important questions that will need to be critically examined as future work in this space emerges. In particular, we should be mindful of the possible tensions between expert knowledge and parents’ approaches to parenting; the distribution of power in the educational space, especially as seen by lower socio-economic status families; as well as key discussions about what does ‘supporting the well-being of children’ mean, for whom, and who should make decisions. Existing work in CSCW and HCI in similarly complex settings such as healthcare [14] or persuasive computing more broadly [46] can serve as starting points for examination of these aspects.

Evaluating learning
This work has focused on exploring the potential of technology to enable important parent-child interactions that are needed for social-emotional learning to occur (cf., RQ1-3) but are seen as hard to establish at home with existing SEL methods. The deployments have, however, not aimed to test whether the scaffolded interactions lead to actual learning outcomes for the child or the parent.

Any such evaluation should distinguish between evaluating the success of the delivery channel (i.e., has the information reached the parents at all and has system scaffolded the relevant kind of parent-child interactions?); and whether the delivered content was psychologically powerful (i.e., have the interactions lead to lasting changes in parents’ or child’s behaviour?). While the former is more easily detectable during the deployment (e.g., through the methods used here such as logging or recording of interactions), evaluating the psychological effects of the interventions require specific experimental methodology that is applicable in-the-wild deployments: Quasi-experimental studies or Randomised Controlled Trials are the most common approaches (cf., [12, 42]). Coyle et al. [8] and Slovak and Fitzpatrick [43] recommend a two-stage approach to such evaluations, where the initial evaluation are ran by HCI researchers to establish that the systems are likely to lead to positive outcomes, but the needed large scale experimental evaluations are progressively led by SEL experts.

Existing SEL literature also provides well-tested indicators of SEL interventions outcomes e.g., see [10] or [11, chp.19]. These include methods such as specific behavioural tasks, questionnaires, real-world indicators such as academic outcome or lowered behavioural issues, or established coding systems for a detailed analysis of subsequent natural parent-child interactions.

CONCLUSIONS
This paper presents the first exploration into the role digital technology could play in bridging the home-school barrier in the context of SEL curricula. We draw on an interview study with SEL experts, representing major SEL curricula providers in US, to identify the key challenges in and learning principles that need to be supported for SEL reinforcement to take place – the reliance on active, experiential learning as well as the importance of scaffolding the parents’ scaffolding role. Through the design and deployment of a technology probe in
two complementing contexts, we gathered a nuanced understanding of how technology-based interventions might reach out and engage parents, as well as help them to scaffold learning experiences that reinforce their children’s SEL skills at home. Overall, our findings point to the potential of digital technology to support parent-child interactions that can reinforce social-emotional learning, providing an important first step for future research in this direction.

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