Breakdowns in Home-School Collaboration for Behavioral Intervention

Gabriela Marcu
University of Michigan
Ann Arbor, MI, USA
gmarcu@umich.edu

Allison Spiller
University of Michigan
Ann Arbor, MI, USA
aspill@umich.edu

Jonathan Arevalo Garay
Drexel University
Philadelphia, PA, USA
jea76@drexel.edu

James E. Connell
Drexel University
Philadelphia, PA, USA
jec338@drexel.edu

Laura R. Pina
University of Washington
Seattle, WA, USA
lpina@cs.washington.edu

ABSTRACT

For some children, behavioral health services are critical in supporting their development and preventing adverse outcomes such as school dropout, substance use, or encounters with juvenile justice. Schools play an important role in identifying problem behavior and providing appropriate intervention, and these efforts are most effective when executed in collaboration with parents at home. However, home-school collaboration is difficult to achieve. In this work, we investigated lack of information sharing as a barrier to collaboration, through a qualitative study including observation, contextual inquiry, and interviews. We found that policies, processes, and tools for documenting behaviors in schools are implemented without significant consideration toward exchanging information with parents. Consequently, a lack of effective two-way information sharing tended to hinder collaboration and erode trust. Combining our empirical findings with evidence-based strategies for parent involvement, we discuss design opportunities for promoting collaboration toward positive behavioral outcomes for children.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in collaborative and social computing**; • **Applied computing** → *Psychology*.

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Behavioral psychology, special education, collaboration

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1 INTRODUCTION

There have been significant increases in the use of behavioral and mental health services to address autism spectrum disorders, attention deficit hyperactivity disorder, conduct disorders, anxiety, trauma, and other needs among children in the United States [6]. By law, schools in the U.S. have an obligation to identify behavioral health needs and provide appropriate behavioral intervention [40, 41, 47]. School practitioners involved in behavioral intervention include educators, paraprofessional educators, therapists, social workers, and school psychologists.

Increasingly, school-wide behavioral intervention and support models are implemented to assess all children for disruptive behaviors, and intervene early (as early as preschool) to improve outcomes [17]. School psychologists define disruptive behaviors in young children as "recurrent patterns of negative, defiant, or externalizing behaviors directed outwardly by the child, often in excess and considered inappropriate by teachers and other school personnel" [39]. School-based intervention involves placing the child in a classroom equipped to provide the appropriate amount of structure so that desired behaviors are frequently rewarded, and problem behaviors are gradually reduced through behavior modification techniques [11], therapy, and/or medication.

The effectiveness of behavioral intervention at school depends on parents maintaining the intervention when the child is at home. When parents and school practitioners collaborate on behavioral interventions, children exhibit fewer

disruptive behaviors [46]. Home-school collaboration is defined as involving parents in: (1) developing and planning behavioral intervention, (2) delivering behavioral intervention, and (3) providing the child with quality feedback about their behavior [46]. Collaboration improves outcomes because if a child does not receive similar feedback about their behavior at home, the structured reinforcement at school will be less effective [7, 39].

However, studies across the U.S. show that home-school collaboration is difficult to achieve [46]. Underfunded and under resourced, behavioral health services in schools are overwhelmed by the amount of need [10]. Often, less time is spent per child than is legally required or clinically effective—including time spent communicating with parents [41]. The lack of guidance from policy on how to implement interventions, a strain on resources, and a culture of litigation have created tensions between school practitioners and parents [34]. As a consequence of parents' perceptions that services are not adequately meeting their child's needs, special education law has notoriously high rates of litigation [3, 5]. In other words, collaboration breaks down because there is a mismatch between expectations and actions as they unfold across the boundaries of home and school [15].

Within the challenging climate of home-school interactions, some parents and school practitioners are appropriating various technologies in an effort to address these breakdowns [27]. Parents and school practitioners are using text messaging, mobile apps, camera phones, and social media to exchange behavioral information, but both parents [27] and school practitioners [30] continue to struggle to share information in a way that helps maintain the intervention and track desired outcomes. The aims of this work are to understand the challenges of information sharing in this context, and their role in collaboration breakdowns:

RQ1: To what extent do practices of information sharing between school practitioners and parents contribute to breakdowns in collaboration?

RQ2: What are design opportunities for promoting home-school collaboration?

We conducted a qualitative study that consisted of: (a) observing how behavioral interventions are implemented and documented at school; and (b) interviewing school practitioners and parents about factors and barriers affecting how they share behavioral information between each other.

During our analysis, emergent themes appeared strongly tied to the U.S. context, based on resource allocation and a unique culture of litigation, which can combine to significantly erode trust. We therefore conducted supplementary data collection outside of the U.S., in order to validate and generate broader design insights. We chose to conduct supplementary data collection in Sweden, in part due to the country's free universal healthcare system, which has been linked to greater use of behavioral health services there [37]. Despite relatively well-resourced services, collaboration between home and school is still a challenge in Sweden [20, 37]. Data collection in Sweden enabled our analysis across contexts to be grounded in two key similarities. First, Sweden has similar policies requiring behavioral health services at school (focused on IEPs, as described in the next section), with similarly vague guidance on how to implement and document these services [2, 20, 38]. Second, Sweden's systemic approach to behavior management in schools draws from similar evidence-based strategies [20, 37].

This paper extends the literature by describing a context in which collaboration is fraught with breakdowns, due to a combination of sociotechnical factors. As a result, our design guidance focuses on helping researchers to engage with opportunities for design with special attention to what can and cannot be changed, and what greatest risks should be avoided (e.g., those related to privacy and legal issues). Our cross-cultural approach enabled richer analysis of the challenges with sharing behavioral information across home and school, and helped us to understand more broadly applicable design opportunities.

2 RELATED WORK

Research in school psychology has long examined the importance of collaboration between home and school to improve a child's behavior [7, 39, 46]. Yet effective home-school collaboration remains "often difficult to achieve because of uneven parent involvement and the time required for planning and training" [46]. We draw particularly from Vannest et al.'s research on improving student outcomes through parent involvement in the full process of planning and delivering interventions [46], to contribute to the relatively sparse literature on home-school collaboration from a human-computer interaction (HCI) perspective. HCI literature has focused on behavioral intervention implemented either by parents at home, or by professionals and practitioners at school.

Individual Education Programs (IEPs)

Once a behavioral need has been identified in the school setting, U.S. and Swedish law require school practitioners to document and implement a behavioral plan. These are called Individual Education Programs (IEPs) in the U.S., and Läroplan or Individual Educational Plan (also IEPs) in Sweden. In the U.S. the IEP is a federally mandated document [47] intended to formalize plans for behavioral intervention, but in practice the IEP is vaguely defined [31, 43, 45] and its implementation varies considerably [44]. In Sweden there are similar challenges with implementation of IEPs, including lack of parent involvement [2, 20].

U.S. parents report frustration with the lack of information they receive about their child's behaviors at school and

progress on IEP goals throughout a school year [27]; in Sweden, parents may not even know their child has an IEP [20]. IEPs are ostensibly used to document a child's behavioral needs, outline what interventions will be used to address behaviors, and set measurable behavioral goals for the school year. But actual practices of documenting behavior at school on a daily basis are not well aligned with the IEP or the related aim of sharing information with parents [28, 30]. In practice, the IEP is used as a legal contract, and does not serve as a useful tool for ongoing communication or collaboration [26]. Efforts shifting to computer-assisted management of IEPs have raised concerns that computerized methods are focusing on minimal compliance by reducing cost and time, rather than exemplary compliance by improving quality of documentation [43].

Collaboration between home and school

Prior HCI research has identified a need to design systems that bridge the gap between home and school, to provide consistent behavioral reinforcement and help students generalize skills they gain in school to more settings. Our work contributes to these important aims, and adds to the growing body of work on children's behavioral and emotional wellbeing. We contribute an empirical understanding of the challenges that school practitioners and parents experience in sharing behavioral information over time.

Systems for use by parents have included capture and access of behavioral occurrences in the home [22, 35], and support for home-based behavioral intervention during moments of tension [36]. These technologies have not explicitly focused on exchanging information with school practitioners, but one study revealed parents' desire to understand more about their child's behavior at school [27].

In school settings, system design and evaluation has focused on capturing the context of behaviors to help with determining appropriate interventions [19, 24]. Abaris [23] was designed to make team meetings between therapists and parents more objective through structured representations of captured behavioral data, and to facilitate conversations about effectiveness of interventions. Slovák et al. studied implementation of school curricula on social-emotional skills such as self-awareness, emotional regulation, and empathy [42]. With a preventative focus on children without IEPs or behavioral concerns, their work identified a need to engage parents in helping their children apply and generalize these skills outside of school. Slovák et al. called for more research to explore "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" [42]. Our work contributes to these efforts toward improving collaboration between home and school.

3 CONCEPTUAL FRAMEWORK

To understand how the process of home-school collaboration is enacted around information sharing practices, we use the collaborative reflection framework. Collaborative reflection describes the iterative process of health services that are: not suitable for standardization, focused on long-term care rather than acute care, distributed across environments, and provided by reciprocally interdependent stakeholders [28, 29]. The framework is comprised of two iterative loops, which illustrate how everyday information sharing drives collaboration over time (see Figure 1).

Using the long-term loop, we consider how home and school must work together to: determine an appropriate intervention, apply the intervention consistently, monitor and evaluate the effects of the intervention, and disseminate information on progress toward behavioral goals. We investigate to what extent information is shared across the boundaries of home and school, and how a lack of adequate information might contribute to breakdowns in collaboration:

RQ1: To what extent do practices of information sharing between school practitioners and parents contribute to breakdowns in collaboration?

In order for useful information to be shared for collaboration, it must be appropriately recorded and stored. The short-term loop of collaborative reflection describes the everyday information management practices that enable coordination on interventions. These practices involve: quantifying, measuring and recording behaviors; sharing records to reflect on behaviors individually and collectively; and corroborating interpretations of behaviors across different perspectives. We investigate how these practices are uniquely enacted in special education, to identify design opportunities for promoting collaboration within a challenging, barrier-riddled context:

RQ2: What are design opportunities for promoting home-school collaboration?

We used the collaborative reflection framework to conduct an empirical investigation of home-school collaboration for behavior management. We compared our empirical findings to literature from school psychology on improving behavioral outcomes through parent involvement (e.g., [12, 46]). Vannest et al.'s meta-analysis [46] of what constitutes effective parent involvement was particularly well aligned with the process of collaborative reflection, so their evidence-based strategies ultimately framed our discussion of design opportunities.

4 METHODS

In this qualitative study, we involved participants from both sides of home-school collaboration to investigate these perspectives together. We took a phenomenological approach,

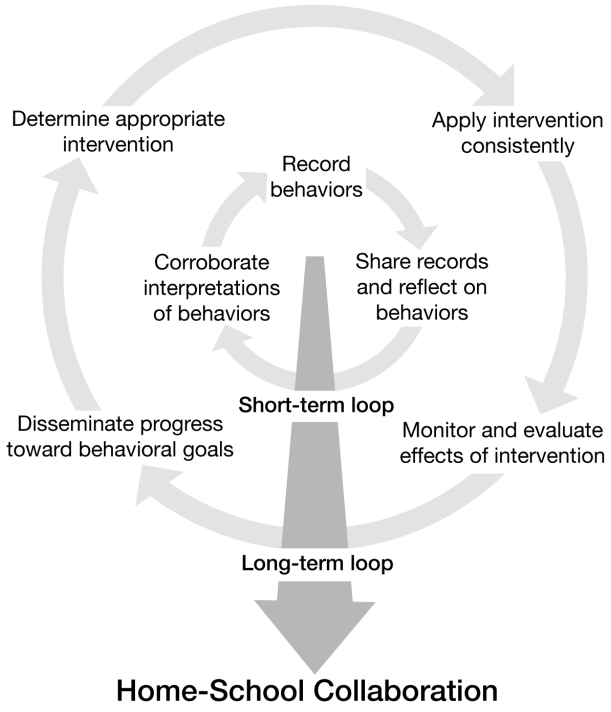

Figure 1: Home-school collaboration represented as a process of collaborative reflection. We identified design opportunities earlier in the process, within the short-term loop of collaborative reflection, as behavioral records are created and shared.

focusing our data collection and analysis on the actors, objects, responses, and situational meaning that make up interaction as it is embedded in the cultural world [14]. In line with this approach, we aimed for a smaller sample size, and we built rapport with participants in order to learn from their experiences with home-school collaboration. We compared data from naturalistic observation [25] in schools, contextual inquiry [4] with school practitioners involved with IEPs, and semi-structured interviews with parents of children with IEPs. Our data collection began in the U.S., and emergent themes related to the amount of litigation in American special education led us to complete a supplementary round of data collection in Sweden, to validate our design insights more broadly.

Two common types of special education placement were included in our study: self-contained and inclusion classrooms. Self-contained classrooms exclusively serve students with IEPs who need significant accommodation. Due to the high level of intervention required, these classrooms have a lower student to practitioner ratio. In contrast, inclusion classrooms place students with IEPs among students without IEPs, thereby enabling more independence and opportunities to interact with peers in a more typical setting.

U.S. recruitment and data

We conducted over 200 person hours of naturalistic observation in two self-contained special education classrooms and one inclusion classroom, all within the same school district. The school district was located in a suburban area with individuals ranging from middle to lower socioeconomic status. The self-contained classrooms were staffed by one teacher and two paraprofessional educators. The inclusion classroom was primarily staffed by one teacher, and included one child with an IEP, supported by one paraprofessional when this additional support was available. Since all three classrooms were in the same school district, we were able to observe a range of practitioners working together to meet the behavioral needs of its students, including teachers, paraprofessional educators, behavior analysts, social workers, and school psychologists. Notes were taken during observation, and regularly analyzed during weekly meetings with the research team.

We also conducted contextual inquiry with 10 school practitioners (teachers, paraprofessional educators, behavior analysts, and social workers), whom we recruited from the same three classrooms where we observed. Six parents of children with IEPs participated in a semi-structured interview (five in person, one by phone). We recruited parents via a posting on a university website advertising studies related to autism spectrum disorders.

Swedish recruitment and data

Three parents in Sweden participated in a semi-structured interview (two by phone, one by email). All participants were from suburban areas and of middle to lower socioeconomic status. Recruitment occurred through Facebook, university bulletin boards, and word of mouth. The inclusion criteria for parent participants was that their child currently, or recently, has had an IEP and/or a behavioral diagnosis. All were interviewed in Swedish, and transcripts were translated to English by one of the authors.

One special education teacher participated in contextual inquiry in his classroom for 60 minutes. We asked him to discuss his daily activities that involved engagement with parents, demonstrate his methods of sharing information with parents, and describe his classroom activities and environment. He was given the option to speak either in English or Swedish, depending on his comfort level, and he chose English. During analysis, this contextual inquiry was compared with literature on special education services in Sweden.

Data analysis

Interviews and contextual inquiry lasted 30-120 minutes and were audio recorded with permission, then selectively transcribed during analysis. All data were compared and

analyzed in English starting with affinity diagramming [4], followed by three rounds of inductive thematic analysis [18], and the constant comparative method [8]. Members of the research team discussed, compared, and interpreted the data on a weekly basis.

5 FINDINGS

Our study revealed that behavioral intervention maintenance across home and school is hindered by breakdowns in information sharing. With only vague guidance from laws concerning implementation of IEPs, school practitioners' practices of documenting and monitoring behaviors vary significantly. Furthermore, behavioral records are primarily created by school practitioners for internal use. Consequently, these records are not easy to share with or be consumed by parents. Without adequate information from practitioners, parents cannot reflect on behaviors and interventions taking place at school and maintain them at home.

Given the amount of parent involvement required for effectiveness, there is a need to address the challenges of keeping parents informed and engaged in their child's behavioral intervention plan. To this end, the collaborative reflection framework (Figure 1) enabled us to understand practices of information sharing within the context of an iterative process that ideally adjusts over time, driven by frequent reassessment of the behavioral needs of the child.

Using the collaborative reflection framework, in this section we describe the information-related challenges that resulted in breakdowns occurring between activities of collaborative reflection: (1) barriers to determining an appropriate intervention, (2) challenges of sharing information about desired and undesired behaviors, (3) lack of circumstantial detail about behaviors, (4) lack of two-way infrastructure for information sharing.

Barriers to determining an appropriate intervention

School practitioners and parents have limited opportunities to establish a working relationship. Parents in the U.S. lamented they do not get enough opportunities to meet face-to-face with school practitioners, particularly within the constraints of work schedules: *"The staff are very 9 to 3:30, and I only get 30 minutes for lunch. I want more of their time"* (Stacey[1]). School practitioners in the U.S. echoed the infrequency of their face-to-face meetings with parents—as few as once per year. In Sweden, in-person meetings were reported to be more frequent overall, as often as a couple of times per month. Oscar, a teacher in Sweden, described the importance of establishing a relationship and getting to know one another at the start of a collaboration:

> *"In order to improve communication, teachers need to be careful in the beginning and try to understand how the parents are [in terms of their personality]. You need to know the parents ... There are four meetings with the parents in person before their child starts at this school."*

No U.S. participants reported nearly this amount of interaction between school practitioners and parents. This level of interaction may also not always be possible in Sweden. Infrequent in-person interactions in both countries make it difficult to share behavioral information between school and home. In addition, the lack of opportunity to get to know one another may make it more difficult to reach agreement during collaboration.

Camille (U.S) felt that school practitioners did not recognize her daughter's special needs and had unrealistic expectations of her daughter as a result. The mismatch between her expectations and the school's actions were a breakdown. Consequently, Camille became a strong advocate for what interventions should be used with her daughter, describing her collaboration with the school as *"I feel like I'm always at war"*. Camille's situation underscored the importance of information sharing in this context, because behavioral and emotional needs are less obvious than physical impairments that can be quickly discerned and characterized. Disabilities studies has grappled with the challenges of invisible or hidden impairments, which are "life limiting but not readily discernible to others" [13], and present unique social challenges [32] for negotiating an individual's needs, compared to, for example, accommodations for physical impairments such as the use of a wheelchair.

Agreement over intervention is also challenging because it is not a one-time decision. Behaviors can be constantly in flux, and differ between home and school, so they require regular reassessment. As a result, parents who thought they were in agreement with school practitioners could find themselves uninformed over time as their child's behaviors change at school. Stacey's son, a fifth grader (U.S.), would sometimes be facing serious disciplinary action before she learned of any problem behavior: *"I only hear about incidents when it has reached the point of suspension and it is too late"*. If parents are informed about more minor incidents, they have the opportunity to help address problem behaviors before they escalate. Stacey articulated the need for more proactive—rather than reactive—information sharing from school practitioners.

Our classroom observations provided more context for the lack of information experienced by parents like Stacey. We observed a tendency for school practitioners in the U.S. to more thoroughly document the most severe incidents, because they were concerned with justifying their responses

[1] All names are pseudonyms.

to problem behavior in order to protect themselves against potential litigation from parents. These findings are in line with other work on the use of IEPs as legal and contractual documentation rather than communicative documentation [26]. IEPs as policy, and as implemented practice, are not written to facilitate communication. They represent a formal agreement to intervention, and we found that school practitioners do not have the time, processes, or tools for more informal and proactive communication. School practitioners in both the U.S. and Sweden noted that they did not readily have behavioral records in a form that could be shared with parents, administrators, or other stakeholders to facilitate communication about a pattern of behavior that required intervention.

Challenges of sharing information about desired and undesired behaviors

School practitioners in both the U.S. and Sweden sometimes experienced challenges sharing behavioral information with parents based on whether it would be perceived as good news (child exhibited desired behaviors and rarely engaged in school rule violations) or bad news (child's undesired behaviors led to violations in school rules). Interestingly, information about both desired and undesired behaviors each posed problems during collaboration.

A common theme among school practitioners we studied across the U.S. and Sweden was that parents of their students may also exhibit behavioral and mental health issues. School practitioners therefore expressed concerned that certain parents can misuse information about problems at school, for example punishing their child. Oscar, a teacher in Sweden, explained the dilemma faced in deciding whether to share information with some parents about behavioral incidents at school, knowing this information could destabilize a child's home environment. With one mother, their concern led his classroom team to send her encouraging information via text message every day:

> *"One mother was so worried about her boy. So we only sent good things, short [daily text] messages on the phone. Because it was so important how she [interacted with] her boy at home. We thought that she was traumatized. We thought that she had problems too. ... Sometimes I can't decide myself if it's good or bad to tell the whole truth. You have to take many things into consideration when deciding what you can say to improve the child's situation."*

We found that the information reported by school practitioners, and the way it is reported, affects how parents react to learning about their child's behaviors and interact with their child, which builds on other research focused only on parents in the home [36]. School practitioners take many factors in consideration when culling, curating, and presenting information for consumption by parents. Thus, consistent application of interventions is not necessarily facilitated by sharing information with everyone in the same way.

Although we have discussed the need for increasing the amount of information that is shared with parents, automating this process would be risky. For instance, we found that school practitioners make a strong distinction between data recorded for their own use, versus data recorded for the purpose of sharing with parents. School practitioners we observed in the U.S. were careful to make sure that information was delivered to parents in a way that was sensitive, diplomatic, and tailored to the emotional needs of the child and parent—thus often making information more biased toward desired behaviors and more encouraging in tone. In contrast, internal information and documentation tended to be more clinical and objective, with a greater focus on undesired behaviors. Thus, systems that promote information sharing across home and school need to help users distinguish and maintain separate audiences.

Sharing information about desired behaviors posed different challenges. Participants across home and school, Sweden and the U.S. valued sharing information to celebrate desired behaviors. However, we found challenges with capturing this information regularly. School practitioners prioritized maintaining a safe and focused environment, so they were concerned with responding to reduce undesired behaviors, and therefore not always able to provide praise for instances of desired behavior. We also saw this tendency reflected in the records that were created for internal use. In the context of such resource-constrained services, we saw institutional pressure and individual concern drive the recording of unsafe and inappropriate behaviors. When it came to desirable and prosocial behaviors, school practitioners might offer verbal praise, but we rarely saw them create a record.

Overall, our findings reveal various social challenges in capturing then sharing records that accurately and holistically reflect a child's behaviors. Both parents and practitioners discussed their awareness that data on desired behaviors can be overlooked, and described efforts to address this issue. Lydia, a parent in the U.S., encouraged her child's classroom team to write down what she called 'celebrations of today' to highlight desired behaviors. Similarly, Oscar described always trying to include at least one prosocial behavior in his reports to parents, adding: *"they need to hear these good things, that's the most important thing here [that we do for students]"*. The challenge of recording and sharing desired behaviors was commonly faced among our participants, several of whom adapted their practices to promote more sharing of this type of information.

Lack of circumstantial detail about behaviors

Parents across the U.S. and Sweden reported that information shared with them lacked adequate detail for understanding the circumstances of their child's behavior at school. They also needed information to be tailored more to the goals and progress of their child. For example, Camille's daughter was in an inclusion classroom, where the teacher sometimes asked students to choose partners for activities. This task, while common in regular classrooms, posed a problem for her daughter because of her difficulty initiating contact with the other students. Camille wanted more information about how her daughter handled this situation in the classroom, so that she could help her daughter develop social skills at home to prepare her for various situations she will face in her life. Similarly, Nova, one of the Swedish parents, wanted more information about the school practitioners' work on improving social skills—such as making friends, taking turns, and prosocial behavior—so she could also work with her child at home on these skills.

During classroom observation in the U.S., we found that paper data sheets were used by school practitioners to record behaviors while simultaneously providing intervention throughout the school day (e.g., by correcting or praising behavior). Therefore, the design of the data sheets prioritized ease of in situ data collection on as many as 12 students at one time by as few as one practitioner. While striving to equitably maintain records for all of their students, school practitioners could not always capture much detail on one individual student. Incidents that were subjectively critical enough to potentially require escalation (such as referral to principal's office or suspension) would necessitate a separate form, which was filled out with paragraphs of detail about what transpired. These observations matched the concerns of parents who would not hear about problem behaviors until they had escalated and required a formal report.

For most daily behavioral incidents, as little as one tally mark under a behavioral category was common. Neither the time available, nor the compact format of the data sheets, allowed for more detail. Sometimes school practitioners would annotate tallies of behavioral occurrences with short notes consisting of one to two words, or abbreviations, but these were mainly meant to help them recall or decode details of the incident at a later time. Thus, even when school practitioners tried to annotate their data with some useful nuances for later reflection, these were not recorded in a format meant for others to read, and rarely made their way to parents.

We observed use of a separate form for providing parents with a daily report of their child's behavior that school day. Although these forms were filled out individually, they constituted a significant additional workload for school practitioners that would take them away from their hands-on work with students or require additional time from them after school hours. As a result, the reports were typically comprised of general comments written about the classroom's activities that day. School practitioners were rarely able to include information about each child's behaviors that day. Lydia overcame this challenge by working with her child's teacher to create a custom template for her paper reports, tailored to the information she wanted to learn about her child's day at school. According to Lydia, she successfully used this approach for several years with different teachers, all of whom were open to creating and using a custom template together.

Lack of two-way infrastructure for information sharing

Infrequent in-person interactions make it difficult to share behavioral information between school and home. To overcome the infrequency of in-person interaction and the limitations of paper-based records, sometimes information was shared through informal channels such as email, online social networks, text messages, etc. Without established two-way infrastructure for information sharing, we found that having information distributed across different technologies and artifacts hindered collaboration.

Parents wanted to respond to the information sent home, and have opportunities to communicate as they were reflecting on their child's progress on behavioral goals. Stacey explained that she would like to have dedicated space on the paper sheets sent home for her to enter comments and to ask questions about behaviors that are documented by school practitioners. Stacey tried to appropriate existing paper-based practices to meet her needs by returning paper reports back to the school with questions and comments written on the back. When school practitioners did not reply, she decorated the front page of the report with arrows and wrote, *"look on the back"*, which resulted in a response. A similar exchange was reported by Swedish parent Alma, who explained the use of a contact book sent between home and school through her son during a previous school year. School practitioners would not always read what she wrote in the book, and sometimes she did not notice when they had written something. She noted that she would have preferred a more direct and conspicuous method of exchanging information.

We found that two-way information sharing was critical to keeping both parents and school practitioners updated. Updates were helpful for reflecting on long-term progress or daily work with a child. School practitioners reported that parents sometimes shared information that is useful to the classroom staff. For instance, practitioner Sandra received an email from a parent warning that their child was having a difficult morning. William, a teacher, mentioned that one parent

periodically sends him such texts or emails. These warnings can help classroom staff be more prepared to respond to behaviors as they escalate on particularly difficult days. Similarly, sometimes children miss a dose of their medication and their behavior is affected. Several times during our observations, school practitioners noticed enough of a change in behavior that they surmised a dose had been missed, and commented that *"some heads up [from the parents] would have been nice"* (Charles).

Some school practitioners had adopted a range of communication channels to meet the needs of different parents. Oscar reported adapting, to some extent, communication methods for each parent: *"There is no specific communication medium that can be used for all parents. All of their wants and needs are too different"*. William, a teacher in the U.S., successfully adopted Appletree, a free product that enables teachers to broadcast information to parents either class-wide or individually. Appletree enables communication across iOS, Android, and web applications, and William reported that parents responded well to having the choice between receiving text, email, or in-app notifications. William explained that he enjoyed using Appletree because the parents were able to choose how they received the information, but there was no extra work on the part of the teacher if each parent chose a different medium. He appreciated that there was no extra work for the teacher while providing the parents with a variety of communication options.

6 DESIGN OPPORTUNITIES

Although we saw some evidence of effective collaboration, our findings primarily reflect breakdowns. The descriptions of these breakdowns improve our understanding of how tensions build in order to result in the widespread litigation that is well known in U.S. special education. To address these problems, our findings indicate that more work is needed on the basic building blocks of collaboration between home and school. A parent like Stacey, who says she hears about behavioral issues when *"it is too late"* for her to act, is seeking the opportunity for collaboration. A parent like Camille, who says *"I feel like I'm always at war"*, does not even have a sense that she is working on the same team as her child's school. Such evidence from our study reveals a dichotomy of "us" versus "them", which requires work to overcome for effective collaboration. Design efforts could make an impact on this challenge by using social identity theory [21] to bridge the distinct identities that are socially constructed based on the organizational and geographical separation of home and school. Visual cues can reinforce a team identity surrounding behavioral intervention for the child. As interaction is mediated among team members, design choices should avoid reinforcing which members of the team represent the school, for example, and instead promote the idea that all members of the team represent the interests of the child.

Our findings also indicate that interactions between home and school cannot be assumed to have mutual trust. For example, school practitioners were concerned with documenting clear justifications for their responses to problem behavior in order to protect themselves against potential litigation from parents. They were also sometimes hesitant to share information about problem behaviors out of concern that parents may punish their child. Mutual trust in the context of home-school collaboration is "confidence that another person will act in a way to benefit or sustain the relationship, or the implicit or explicit goals of the relationship, to achieve positive outcomes for students" [1]. Our study suggests important opportunities to design for more explicit goals for the collaboration, in addition to goals for the child's behavior. Goals for the collaboration could include maintaining agreement about what the child's needs or goals are, or applying specific behavioral strategies consistently across environments. Goals for a child's behavior are important common ground that should be used to ground communication often, using techniques such as those from Clark and Brennan [9].

In their meta-analysis of school-based behavioral intervention, Vannest et al. [46] found that effective home-school collaboration involved parents in three important activities: (1) developing and planning behavioral intervention collaboratively, (2) delivering behavioral intervention consistently across environments, and (3) providing children quality feedback about their behaviors. We use these evidence-based strategies to discuss design opportunities based on our our findings, with a focus on enhancing existing efforts without significant added workload.

Developing and planning behavioral intervention collaboratively

We observed how and why parents are not always involved in developing and planning behavioral intervention for their child. We therefore see an opportunity to leverage the technologies parents are already using in their everyday lives to lower the barriers to their involvement in development of IEPs. Much of the information sharing required for behavioral intervention involves private health data that may not lend itself well to all mobile and social technologies. However, our findings suggest that providing a wider variety of communication channels that can accommodate varied needs among parents can serve to promote trust and build empathy. For example, Facebook would not be appropriate for storing or exchanging private health data, but could help to increase general communication and pave the way for collaborative efforts, including eventual exchange of private health data through more secure channels.

Collaborative technology could be an equalizer in home-school collaboration. Meetings are typically on school grounds, led by school practitioners, and guided by data managed within the school. Our findings are in line with other work describing how parents can feel like outsiders [12], and we saw that they experience a lag in catching up with the information already shared internally among school practitioners. Providing parents with information about the process before or during IEP meetings and other occurrences of formalized collaboration could empower them to engage in situations that have been described as potentially intimidating or marginalizing [12]. Parents could benefit from technologies that walk them through a process that is less familiar to them than it is to school practitioners with a caseload much larger than only their child. For school practitioners, an adaptation of the medical checklist [16] that helps experts avoid mistakes during routine tasks, could structure aspects of the process that can be standardized, so they can focus on the unique needs of a child and engaging with the parent (which would also provide peace of mind for parents).

Shared artifacts could also increase parent involvement in the delivery and planning of behavioral intervention by providing them the means to document or express areas of concern for their child's behaviors. Many IEP decisions are driven by school practitioners' assessments, the results of which must be interpreted for parents. Providing parents an accessible way to perform their own assessments and state their concerns in their own words could empower them to have a voice in identifying their child's needs, setting goals, and determining appropriate reinforcement strategies. Parents could also be provided a mechanism for giving input on what behaviors should be monitored, and how they should be measured. We found that parents sometimes had useful suggestions to contribute, but were not given many opportunities to communicate them to school practitioners, who had sole ownership of data management and led most daily decision-making.

Mobile and social technologies could scaffold the process of planning and monitoring behavioral intervention in order to help all stakeholders be on the same page over time, through access to the same data. To facilitate the unstructured collaboration we observed, technologies could set a roadmap for steps and milestones that are required, while enabling the flexibility to adapt them to the needs of students and parents. Shared artifacts such as a visual roadmap to communicate goals and established potential reinforcers clearly to all relevant stakeholders, and a calendar for managing meetings and milestones, could help to establish the common ground around which to center collaboration. Shared visualizations should be meaningful to both parents and school practitioners, and present the minimum amount of information to spark collaboration without overwhelming any individual. These visualizations could facilitate synchronous face-to-face collaboration (e.g., at IEP or back-to-school meetings), as well as keeping stakeholders informed asynchronously.

Delivering behavioral intervention consistently

Once a plan has been established, behavioral intervention requires consistent and coordinated daily implementation according to that plan. However, our work found limitations in regular communication and coordination between parents and school practitioners, who predominantly communicate through infrequent phone calls and face-to-face meetings. Physical documentation of behavioral incidents, the intervention delivered, and progress toward goals is most often designed for internal school use and not shared with parents. Reports sent home to parents are separate physical documentation that creates additional work for school practitioners, and in practice are generated without enough detail or context to be useful to parents.

For monitoring behavioral data, a secure collaborative portal could be used to establish common ground and maintain regular coordination between school and home over the delivery of reinforcers. Using HCI approaches to establish common ground would include visualizations of behavioral data aggregated and updated in real-time, shared editing and annotating of reinforcers and progress, and other features to turn the IEP into a living document that is shared between home and school [33]. The use of shared digital artifacts would facilitate distributed and asynchronous collaboration, and improve awareness among stakeholders, improving the consistency with which behavioral reinforcers are delivered across individuals and settings. For example, even visually displaying photographs and names of which school practitioners and parents or guardians are involved with a child's IEP could improve coordination at school and provide peace of mind at home.

Current practices also do not help with connecting everyday behavioral information to behavioral goals and IEPs. Parents, like school practitioners, need tools to help them make connections in the data such as behavioral triggers, patterns, and trends. Hayes et al. [19] studied the use of capture and access technology at school, which could also support parents at home. Parents need these types of digital artifacts to engage them in the process of behavioral intervention, and help them understand how to effectively deliver reinforcement in the home. For example, automated or practitioner-facilitated recommendations could provide parents with actionable information, helping to increase their confidence and capacity to deliver reinforcers.

Of course, many parents may not benefit from a significant increase in information exchange, or higher expectations

for delivering reinforcers without training in behavioral intervention. Our findings suggest that many parents would benefit from having control over how much information they receive, and how they receive it. To accommodate multiple levels of parent involvement, and individual preferences and needs, we recommend that a variety of customizations be available to parents. For example, visualizations could be more simple or complex, and reminders or notifications could be set to help parents engage with data and communications with some regularity. Monitoring how parents set these customizations could also inform the negotiation of accountability and coordination between home and school. That is, school practitioners could have a better sense of how different parents are engaging with their child's data and behavioral plan, and use this knowledge to tailor their interactions with parents.

Providing children quality feedback about their behaviors

Effective behavioral intervention requires that children be given immediate and specific feedback about their behaviors [11]. Children also need feedback to be aware of their behavioral goals and understand their progress towards them. However, practices we observed did not involve behavioral data in a from that would be useful for providing children with feedback.

We found that parents, and sometimes school practitioners, did not always have adequate behavioral information to reflect on a child's progress, rendering them unable to provide the child with quality feedback. Moreover, there was a tendency to focus on recording and reporting problem behaviors because they stood out more than desired behaviors. We observed multiple consequences as a result of this tendency: behavioral intervention was hindered because desired behaviors were not adequately reinforced; school practitioners experienced lowered morale when they focused on behavioral problems more than behavioral gains; and parents became more discouraged and overwhelmed, making them less effective in addressing their child's behaviors.

Our findings show that design decisions need to not only provide feedback on undesired behaviors, but also encourage awareness of desired behaviors so that they are not overlooked. Design can address bias toward undesired behaviors by including reminders or forcing functions to refocus attention on desired behaviors that should be reinforced. Like Lydia's incorporation of 'celebrations of today', records and reports can be designed to facilitate a greater focus on behavioral gains. Forcing functions can be used to ensure mandatory tasks are not considered completed until data on desired, prosocial behavior are included. Additionally, school practitioners can be incentivized to focus on desired behaviors by tracking the use of reinforcement strategies and providing rewards such as employee of the month or higher evaluations on performance reviews.

Designing to promote awareness of behavioral incidents in real-time could also improve coordination of behavioral intervention across home and school. We observed lag time for parents and some school practitioners learning up-to-date information about behavioral gains, appropriate reinforcers, and intervention strategies. Notifications and alerts could help alleviate problems we observed with information that was shared but overlooked by the receiver. Moreover, improved awareness could help parents and school practitioners to negotiate roles and accountability with regard to partnering for consistent behavioral intervention.

7 LIMITATIONS AND FUTURE WORK

Our analysis was informed by the experiences and opinions of relatively engaged individuals, who self-selected to participate in this study. Recruiting parents who are less involved with their child's school naturally poses challenges for researchers. Creative methods of recruitment and inquiry should be used to elicit perspectives from parents who are less engaged with their child's school. Appealing to a range of parent interests and concerns, while expressly acknowledging competing demands on their time, would help to investigate the various reasons that some parents have lower engagement with their child's school. Providing childcare, transportation, or other incentives could reduce socioeconomic barriers to participation in this type of research.

8 CONCLUSION

Use of mobile and social technologies is increasingly used for information sharing between parents and school practitioners, but little is known about how they can be effectively be adapted into evidence-based strategies for supporting home-school collaboration. There is an urgent need to create stability, continuity, and coordination in support of behavioral intervention across home and school. This paper identifies and describes challenges parents and school practitioners face in sharing information about behaviors, and provides design opportunities grounded in empirical findings on existing practices. We found that when parents were not informed enough to have common ground with school practitioners in regard to their child's behavioral intervention at school, there was a loss of trust or collaborative effort. Our work contributes a discussion of information sharing practices as an important component of collaborative reflection. Effective collaborative reflection in this context can increase parent involvement and improve the consistency with which children receive feedback on their behavior across school and home.

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