Home-School Collaboration in Support of Behavioral Intervention

Author
Institution
Address
Email

Author
Institution
Address
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Author
Institution
Address
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Author
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Address
Email

ABSTRACT

Behavioral health services are critical for some children in supporting their development and preventing adverse outcomes such as juvenile delinquency, school dropout, or substance use. 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, using observation, contextual inquiry, and interviews. We found that policies, processes, and tools for documenting behaviors in schools are implemented without consideration toward exchanging information with parents. As a result, when effective two-way information sharing is lacking, this hinders collaboration and erodes 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*;

KEYWORDS

Behavioral health, 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 [5]. By law, schools in the U.S. have an obligation to identify behavioral health needs and provide appropriate behavioral intervention [46, 47, 54]. 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" [44]. Without intervention, such behaviors can persist or worsen as developmental psychopathology, resulting in increasingly negative consequences in school and life [42]. Disruptive behaviors are indicative of behavioral and social-emotional problems, which may lead to dropping out of school, encounters with criminal justice, incarceration, substance use, and other negative long-term outcomes [45]. 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 [10], 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 [53]. 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 [53]. 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 [6, 44]. This type of collaboration relies on practitioners and parents sharing information with each other about the child's behaviors and the intervention.

However, studies across the U.S. show that home-school collaboration is difficult to achieve [53]. Underfunded and under resourced, behavioral health services in schools are overwhelmed by the amount of need [9]. Often, less time is spent per child than is legally required or clinically effective and even less time is spent communicating with parents [47]. 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 [37]. Special education law has notoriously[1] high rates of litigation [3], a consequence of strained resources and parents' perceptions that services are inadequate. 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 [13].

Within the challenging climate of home-school interactions, some parents and school practitioners are appropriating various technologies in an effort to address these breakdowns [30]. Parents and school practitioners are using text messaging, mobile apps, camera phones, and social media to exchange behavioral information, but both parents [30] and school practitioners [33] 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 analysis, our emergent themes appeared strongly tied to the U.S. context, and the unique culture of litigation that erodes trust. We therefore conducted supplementary data collection outside of the U.S., in order to generate broader design insights. Sweden has similar laws requiring behavioral health services at school, with similarly vague guidance on how to implement and document them [2, 22, 43]. In contrast to the U.S., Sweden has free universal healthcare, which has been linked to high use of behavioral health services [41]. We validated our design insights by exploring a setting where, despite higher resources allocated to services and higher use of services, breakdowns in collaboration were still reported [22, 41].

The contributions of this work are twofold. First, our cross-cultural approach enabled richer analysis of the challenges with sharing behavioral information across home and school, and helped us identify more broadly applicable design opportunities. Second, we discuss design opportunities that focus on creating platforms for two-way information sharing that follows policies and laws while adjusting the presentation and monitoring of behaviors based on the perspective and expertise of the stakeholder (e.g., school practitioners, parents).

[1]https://www.theatlantic.com/national/archive/2012/05/the-litigious-mess-of-special-education/256541/

2 SPECIAL EDUCATION CONTEXT

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. However, federal laws provide little guidance on how to accomplish this in practice. At the policy level, the primary guidance is the Individual Education Program (IEP) in the U.S. [54]. The IEP is a federally mandated document intended to formalize plans for behavioral intervention, but in practice the IEP is vaguely defined [34, 49, 51] and its implementation varies considerably [50]. Sweden has mandated the Läroplan or Individual Educational Plan (also IEP), but there are similar challenges with its implementation, including lack of parent involvement [2, 22].

In practice, the IEP is used as a legal contract, and does not serve as a useful tool for ongoing communication or collaboration [28]. The IEP is typically used for annual decisions such as determining in which classroom to place a child so they can receive the appropriate level of support. Two common types of special education placement—both of which were included in our study—are 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 higher 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.

Throughout a school year, U.S. parents report frustration with the lack of information they receive about their child's behaviors at school and progress on IEP goals [30]; in Sweden, parents may not even know their child has an IEP [22]. 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 [31, 33]. 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 [49].

3 RELATED WORK

Research in school psychology has long examined the importance of collaboration between home and school to improve a child's behavior [6, 44, 53]. Yet effective home-school collaboration remains "often difficult to achieve because of uneven parent involvement and the time required for planning and training" [53]. Human-computer interaction literature has focused on providing support to implement behavioral interventions for either parents at homeo, or for school practitioners at school.

3.1 Behavioral intervention at home

Previous work has focused on supporting parents to understand behaviors and maintain behavioral interventions. KidCam helps parents capture their children's development by capturing segments of audio and video that parents consider moments of interest [24]. ParentGuardian focuses on identifying moments of tension between parents and children to deliver a behavioral intervention

to put into practice during moments of tension [40]. Nazneen et al. explored the potential of ubiquitous computing for enabling parents to capture in-home problem behaviors through selective archiving of video clips [38]. These technologies focus on supporting parents but do not support parents in exchanging information with school practitioners. Furthermore, Marcu et al. provided wearable cameras to children so that they could record context of their activities and behaviors [30]. They found that parents wanted to not only understand behaviors at home but also understand how these behaviors manifest at school.

3.2 Behavioral intervention at school

In school settings, system design has focused on lowering barriers to behavioral monitoring, and capturing the context of behaviors to help with determining appropriate interventions [19, 26]. Through video snippets to contextualize a behavior, CareLog was able to capture a behavioral trigger without much disruption to classroom practices [19]. Abaris [25] focused on organizing captured behavioral data to make team meetings between behavioral therapists and parents more objective, and to facilitate conversations about effectiveness of interventions. This body of work promotes collaboration and information-sharing between school practitioners and call for a need to integrate parents.

With a focus on children without IEPs or special behavioral needs, Slovák et al. studied implementation of school curricula on social-emotional skills such as self-awareness, emotional regulation, and empathy [48]. 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" [48]. Our work contributes to these efforts toward improving collaboration between school practitioners and teachers.

Prior 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.

4 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 [31, 32]. 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

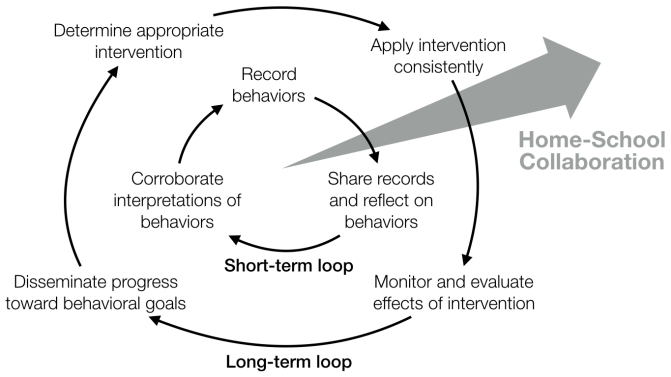

Figure 1: We studied home-school collaboration as a process of collaborative reflection, to identify breakdowns related to information needs. To address these breakdowns, we discuss design opportunities earlier in the process as behavioral records are created and shared.

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?

Using the collaborative reflection framework, we combine empirical findings with evidence-based strategies for improving behavioral outcomes through parent involvement (e.g., [11, 53]). Through this analysis we identify opportunities for designing systems, with consideration to the context of special education, to facilitate home-school collaboration.

5 METHODS

In this study, we involved participants from both sides of home-school collaboration to investigate each perspective. We compared data from naturalistic observation [27] 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.

5.1 U.S. recruitment and data

Existing research relationships with schools were used to recruit practitioners for this study. 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 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 semi-structured interviews (five in person, one by phone). We recruited parents via a posting on a university website advertising studies related to autism spectrum disorders.

5.2 Swedish recruitment and data

Three parents in Sweden participated in semi-structured interviews – two by phone, and 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.

5.3 Data analysis

Interviews and contextual inquiry lasted 30-120 minutes and were audio recorded with permission, then selectively transcribed during analysis. Parent participants represented a range of placements in special education, as well as full inclusion in a general education classroom (e.g., with one-on-one support from a paraprofessional educator). 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 [7].

Members of the research team discussed, compared, and interpreted the data on a weekly basis. During this process, we were particularly cognizant of the fact that school practitioners must collaborate with many parents at once. Increasing the amount of information shared can therefore only be accomplished by reinvisioning or repurposing existing practices, especially without adding tasks in an already underresourced environment. To this end, in our analysis we looked for how parents and school practitioners might similarly describe whether more information sharing is needed, and what collaborative activities they envision could be afforded by more information.

6 FINDINGS

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. This framework allowed us to identify the following information-related challenges which resulted in breakdowns occurring between activities of collaborative reflection: (1) barriers to determining an appropriate intervention, (2) challenges of sharing negative and positive information, (3) lack of circumstantial detail about behaviors, (4) lack of two-way infrastructure for information sharing.

6.1 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[2]). 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."*

None of our 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. In frequent 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. For example, parents in the U.S. reported that it can be a struggle to come to an agreement with school practitioners on behavioral goals for their child.

[2] All names are pseudonyms.

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. Camille was frustrated that school practitioners did not see her daughter's needs the same way she did, and she felt that more intervention was needed at school. 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 often invisible. Invisible conditions and impairments that are "life limiting but not readily discernible to others" [12] present unique social challenges [35] 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. Consequently, 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 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 [28]. 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.

6.2 Challenges of sharing negative and positive information

School practitioners in both the U.S. and Sweden showed a willingness to share more information with those parents who were wanting to engage. However, sometimes they experienced challenges sharing behavioral information with parents based on whether the news would be positive or negative. Interestingly, both positive and negative news about a child's behavior 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. As a result, school practitioners were concerned that certain parents can misuse information about problems at school, for example punishing their child. Oscar explained the dilemma many school practitioners face in deciding whether to share information with some parents about negative 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 positive 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 [40]. 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 giving everyone access to the same information 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 positive in tone. In contrast, internal information and documentation tended to be more clinical and objective, with a greater focus on negative aspects. Thus, systems that promote information sharing across home and school need to help users distinguish and maintain separate audiences.

Sharing positive information about 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.

The lack of positive records prevents sharing of behavioral information that can be used for positive reinforcement. Both parents and school practitioners showed an awareness of this problem, and described their efforts to address it. 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, the Swedish teacher, described always trying to include at least one positive 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 positive behaviors was common among our participants, several of whom adapted their information sharing to promote more positive information.

6.3 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.

6.4 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.

Even with the flexibility of some school practitioners to adopt technologies for information sharing and adapt their practices to different parents, we saw little evidence of these practices facilitating two-way information sharing. Parents praised the use of different communication channels, but did not mention being able to effectively respond to the information broadcasted. For example, Alma in Sweden enjoyed that her child's teacher shared classroom information with all parents at once on a Facebook group, which created an immediate as well as persistent record of communication: *"For minor communication needs, I prefer the Facebook group with parents and teachers because it's quick, saved and it can be accessed later, and it gets sent out to everyone"*. General classroom communication was not enough for many parents, and for practitioners to adapt to the communication needs of each parent would not be scalable or sustainable. School practitioners need appropriate resources and tools in order to adapt to the information needs of parents effectively, and enable them to respond.

7 DESIGN OPPORTUNITIES

Our study examines breakdowns in information-sharing between parents and school practitioners that hinders behavioral intervention maintenance across home and school. We found that the lack of a two-way information-sharing infrastructure that adjusts presentation and monitoring based the perspective and expertise of the stakeholder (e.g., school practitioner or parent) erodes trust and impedes collaboration. With only vague guidance from laws concerning implementation of IEPs, school practitioners' recording and monitoring behaviors varies 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 throughout the iterative and ongoing process of collaborative reflection. Clear processes for two-way information sharing do not exist, and school practitioners do not have adequate tools to organize and review information from parents. The lack of two-way information sharing impedes the corroboration required to have a holistic interpretation of a child's behaviors from the perspectives of both home and school.

In their meta-analysis of school-based behavioral intervention, Vannest et al. [53] 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 identify design opportunities based on our our findings. Our design opportunities are organized by the three activities involved in home-school collaboration and focus on enhancing existing efforts without significant added workload.

7.1 Developing and planning behavioral intervention collaboratively

Breakdowns in collaboration can be severe enough to lead to litigation, indicating an opportunity for improving information exchange in ways that cultivate the common ground and mutual trust required for basic collaboration. When collaboration must take place across distinct identities that are socially constructed [23] (e.g., by the organizational and geographical separation of home and school), the dichotomy of "us" and "them" can become a barrier to collaboration. In order to collaborate, parents and school practitioners must establish a relationship that is built on (1) common ground, or a shared understanding of a child's goals and behavioral reinforcers, with the ability to reference them easily during conversation [8], and (2) mutual trust, or "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].

Parents are not always involved in developing and planning behavioral intervention for their child, and there are consequences to their lack of involvement at this early stage. Gilliam and Coleman [16] found that school practitioners had more influence than parents in IEP decisions because they were empowered by the data they recorded and managed at school. Marcu et al. [32] discuss the role of information management in decentralizing decision-making power within the process of collaborative reflection. We 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. Parents can feel like outsiders [11], and according to our findings 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 may be intimidating or marginalizing [11]. 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 [15] could reduce their cognitive load with regard to automating aspects of the process that are routine to them, 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 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 behavioral reinforcers. 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 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 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.

7.2 Delivering behavioral intervention consistently

Our findings show that providing parents opportunities to engage in collaborative reflection could inform their delivery of behavioral interventions at home, as well as enabling them to help school practitioners interpret and meet behavioral needs at school. Effective interpretation of a child's needs and progress leads to placement and intervention decisions that are more likely to improve long-term outcomes.

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, reinforcers 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 [36]. 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.

Moreover, highly involved parents would be empowered if provided with support for recording and monitoring their own data at home and in community settings. We found that some parents are already documenting their child's behaviors at home, suggesting that they would adopt technologies enabling them to more easily monitor and share their data. In addition to facilitating the observation and manual recording of behaviors, Nazneen et al. have explored the potential of ubiquitous computing for enabling parents to capture in-home problem behaviors through selective archiving of video clips [38].

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 behavioral reinforcers at 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.

7.3 Providing children quality feedback about their behaviors

Effective behavioral intervention requires that children be given immediate and specific feedback about their behaviors [10]. 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 [17]; 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 (potentially to the extent of having a negative effect on behaviors).

Our findings show that design decisions need to not only provide feedback on undesired behaviors but also promote positive reinforcement. 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 positive data are included. Additionally, school practitioners can be incentivized to focus on desired behaviors by tracking positive reinforcement 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.

8 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. We recommend creative methods of recruitment and inquiry in order to promote equity in research activities as well as system design. Moreover, the link between socioeconomic status (SES) and behavioral and mental health needs (in both the U.S. [21] and Sweden [41]) indicates that low-SES parents are an important population for future work. Our data collection in Sweden was limited and only meant to provide supplemental evidence for our design insights. Our analysis touched upon some interesting differences in home-school collaboration in Sweden compared to the U.S., which were out of the scope of this study and warrant deeper investigation.

Despite research indicating that ethnic minorities in Sweden do not experience inequity in access to health services [20], the recent Syrian refugee crisis has put a significant strain on Swedish health services [52]. Sweden has a reputation for its receptiveness and has received the second largest number of refugees from Syria outside of the immediate region [39]. The unique behavioral and mental health needs of child refugees, combined with population growth, pose new challenges to home-school collaboration that require investigation [14][29]. Insights from our work could be used by the broad international community providing support to millions of displaced children to support the behavioral and mental health of displaced individuals.

9 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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