"It's an independent living skill, but covered with fun!": Prompting At-Home Skill Development for Children with Vision Impairment

Vinitha Gadiraju
Wellesley College
United States
vinitha.gadiraju@wellesley.edu

Lucia Jayne
University of Colorado Boulder
United States
lucia.jayne@colorado.edu

Shaun K. Kane
Google Research
United States
shaunkane@google.com

Abstract

This study examined how to design tools that build independence with Blind or Visually Impaired (BVI) children and their families. Beyond core academics, BVI children require instruction on independent living skills, with their curriculum necessitating parent-school cooperation to support continued education at home. However, most technology for BVI children focus on academics, spatial orientation, and physical mobility. In this work, we aim to design a tool for independence that aligns with existing familial structures and activities. Through interviews and diary studies with five families, we explored development practices parents used with their BVI children, parent-teacher relationships, and how a prompting and reflection tool supported family goals. This study highlights home routines and independence skills that benefit from customized prompting, how activity prompts can encourage parents to scale back their assistance and propel independence, and how reflection builds optimism and empowers parents in the learning process.

CCS Concepts

• **Human-centered computing** → **Activity centered design**.

Keywords

blind, visual impairment, teachers, parents, collaboration, expanded core curriculum, learning, independence, skill development, activity prompting

ACM Reference Format:
Vinitha Gadiraju, Lucia Jayne, and Shaun K. Kane. 2024. "It's an independent living skill, but covered with fun!": Prompting At-Home Skill Development for Children with Vision Impairment. In *The 26th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '24), October 27–30, 2024, St. John's, NL, Canada.* ACM, New York, NY, USA, 14 pages. https://doi.org/10.1145/3663548.3675626

1 Introduction

Children with vision impairment often rely on a complex instructional model, and it takes skilled effort for schools to meet their responsibilities to these students. This model involves (1) collaborating within students' social and education networks, (2) extending learning from school into the home, and (3) instructing in multiple skills simultaneously. The model is defined by the Expanded Core Curriculum (ECC) [19], a specialized curriculum for Blind or Visually Impaired (BVI) children, mandating instruction in developmental areas that supplement traditional academics. These skills are best practiced *in-situ* in the home. However, students can struggle to develop these skills for many reasons, including parents overprotecting their children and lowering expectations for their development and performance [53].

Playful, learning-based tools can help facilitate skill-building between parents and children to supplement independent living skill development outside the classroom, particularly since technology and play motivate children to learn [6, 15, 57]. However, most of these tools for BVI children have been targeted toward academic skills and physical mobility, and present new environments which may be hard to integrate with children's existing structures. To create technology for independent living skill development that best serves this group, we must understand the current strategies families use to develop behavioral skills so we can design around realistic practices. With the ECC demanding skill building across home and the classroom, we must also characterize how relationships between families and schools impact skill development. Our paper addresses this need by identifying family values, routines, and relationships, and by designing an activity prompting tool that supports families in their required and personal goals. Specifically, we studied the following research questions:

(1) How do blind or visually impaired (BVI) students currently develop independent living skills with their families at home, and what barriers do they encounter during these routines?
(2) What life skills and values do families emphasize in their homes, and how do schools influence this prioritization?
(3) When given a tool to document developing independent living skills at home through playful prompts, how do parents and BVI children collaborate and reflect?

We investigated these research questions by conducting interviews and creating customized journals that prompt independent living skill development and progress reflection in families with BVI children. The prompts centered on activities developing specific skills that families valued for their children. The journal served as a tool to test personalized skill prompting and prototype activities that can be translated to more robust forms, such as a playful learning mobile application, as suggested by participants during the study.

ASSETS '24, October 27–30, 2024, St. John's, NL, Canada

ACM ISBN 979-8-4007-0677-6/24/10
https://doi.org/10.1145/3663548.3675626

This paper presents the findings from the interviews and journal activities in the form of five case studies. Each case study captures a family's dynamic at home, developmental goals, and daily routines. We also overview how participant families communicate with schools to identify crucial skills, advocate for parental empowerment in educational systems, exemplify how structured prompts can scale back over-assistance and increase independence, and discuss how reflection leads to optimistic views of children's development.

2 Related Work

2.1 The Expanded Core Curriculum

The Expanded Core Curriculum (ECC) supplements traditional academics in the Common Core Curriculum with by adding skills that people with disabilities need to live independently, and providing extra learning support [19]. The ECC covers nine areas of instruction: compensatory skills, sensory efficiency, orientation and mobility, self-determination, career education, assistive technology, independent living skills, recreation and leisure, and social skills. Sighted students learn these *"hidden skills"* through observation [20]. However, BVI students do not have the option to learn skills so informally.

The ECC is widely recognized by educators, parents, students, and international councils as the educational standard for BVI children [13, 29, 54]. Researchers, however, have found varying opinions on how students and parents perceive teachers, their resources, and their ability to teach the ECC effectively. Previous work found that students believe their teachers in specialized programs are knowledgeable but lack time to address all areas of the ECC, particularly components that are more difficult to integrate with academic subjects [2, 29].

Supplemental learning at home can compensate for the lack of instructional time during the school day, yet little work has been done to explore at-home learning for the ECC. Additionally, assistive and educational technology has been shown to engage students with disabilities as active learners and improve learning outcomes [5, 18, 38, 41]. However, very few tools (let alone those integrated with technology) have emerged to support children and their networks during the ECC education process. This paper delves into how a formalized tool can support the informal and complicated collaboration practices that propel ECC skill development. Our research also investigates both explicit instruction of the curriculum and the inadvertent practices of the ECC that develop in the home, particularly independent living skills.

2.2 Parent-teacher communication for students with disabilities in the United States

"Educator" is a term not just reserved for traditional classroom teachers. Educators are a network of people supporting students in different environments while building skills with them. Notably, parents and families support social skills, among many others, for children with disabilities both in and outside school [1]. The communication between parents and teachers to facilitate this learning process is so crucial that it has been formalized in national government acts. The Individuals with Disabilities Education Improvement Act (IDEA, 2004) mandated parent-teacher collaboration to create Individualized Education Programs for students with disabilities [40, 58]. Statewide initiatives for IDEA train teachers and families to align on visions and a mission for students with disabilities and improve student outcomes [39].

Parent involvement in their child's education largely falls into two categories: home-based and school-based [58]. At home, parents help with homework, read as a family, and promote social interaction and behavioral development through chores and leisure time [17]. With their child's school, parents monitor student progress, build curriculum goals through Individualized Education Programs, and receive training on assistive technologies from educators.

Research on the parent-collaboration model has investigated specific skills, such as self-determination [28] and physical education [60]. The value of parent perspectives has also been studied with children with disabilities broadly and in the context of general health and educational services [42]. Our work addresses a gap in parent perspectives in the education domain with BVI children and explores the value of familial input in the education of BVI children.

2.3 Technology supporting independence for BVI children

In recent years, innovative tools have emerged to support BVI children in academic skills, including tactile and smartphone games for Braille and literacy [14, 21, 24, 35, 36], block-based systems to teach coding [26, 27, 37, 56], and expansive auditory environments encouraging STEM skill acquisition [43, 45, 47, 48]. However, technology and research for skills related to the ECC are far less common, despite this curriculum building core components of independence in BVI children.

Technology relating to the ECC have mostly addressed physical development and spatial navigation, or as labeled by the curriculum: Orientation and Mobility. Researchers have produced a wide body of work investigating audio-based, gamified environments that promote skill development in BVI people, including spatial orientation, object position identification, navigating unknown places, and mapping virtual spaces to real world environments [3, 7, 10, 31, 32, 34, 44, 46, 49–52]. Cuturi et al. (2016) explains, however, that many orientation and mobility training tools have low user acceptance and can be too complicated for children [11]. They instead suggest that, *"a framework that might improve the accessibility of these devices to children is the creation of more immediate and natural systems."* Our study aims to adhere to this simplified approach by utilizing everyday activities that families have incorporated into their routines, rather than introducing new environments that may be harder to adopt long-term.

Our study is among the first to investigate tool design within the ECC beyond orientation and mobility. In this work, we focus on a breadth of independent living skills determined necessary by the ECC. This is also among early work formalizing family-defined skills as part of the curriculum that educational technology must address. Finally, we take a qualitative approach to first capture the social dynamics between parents, children, and educators to understand the stakeholders for educational technology in this space, and how an activity tool can consider this network.

Table 1: Demographic information for each participant family, including family members, children's education, and children's visual acuity.

Family ID and members (age, role)	*Child's education*	*Child's level of vision (as described by their parent)*
Family 1 Eloise (9, child) Jamie (36, mother) Jerry (36, father)	Eloise is a 4th grader at a school for the blind.	Eloise has cortical vision impairment and is nearsighted.
Family 2 Audrina (11, child) Justina (30, mother) Lola (57, grandmother) Jim (28, uncle)	Audrina is a 4th grader at a school for the blind.	Audrina is legally blind.
Family 3 Talia (11, child) Gisele (44, mother) Joe (52, father) Jared (13, brother)	Talia is a 6th grader at a school for the blind.	Talia is completely blind in her right eye and nearsighted in her left eye.
Family 4 Chloe (9, child) Morgan (11, child) Amanda (45, mother) Mark (49, father)	Chloe is a 4th grader in the public school system. Morgan is a 6th grader in the public school system.	Morgan is legally blind (20/400). Chloe's weaker eye has a visual acuity of 20/200.
Family 5 Daisy (10, child) Catherine (35, mother) Adam (46, step-father) Eric (8, brother) Amber (6, sister) Rory (10 months, sister) Barry (45, father) Lucy (37, step-mother)	Daisy is a 5th grader in the public school system.	Daisy's visual acuity is 20/200.

3 Methodology

We first interviewed families to assess current independent living skill development strategies and challenges, and to identify skills valued outside the ECC. Based on the initial interviews, we created a journal with customized activity prompts and reflection questions for the family to complete together every day for two weeks (diary study). After completing the prompts, we conducted final interviews to review journal responses and gather overall feedback.

3.1 Participants

This research included five participant families. Four families had one BVI child, and one family had two BVI children. All participant children were between 4th and 6th grade. Table 1 describes each family and their demographic information. All names have been changed throughout the paper to protect participant anonymity.

We recruited families for this study through a local specialized school for the blind, our state's office of special education, and snowball sampling. Our recruitment criteria asked for (1) children who are visually impaired or blind between kindergarten and 8th grade and (2) at least one parent who can complete the study with them. Other family members were also welcome to participate. Adult family members signed consent forms, and each child had an assent form signed by a participating parent. In the consent form, we told families about the purpose of the study, study methods, and time commitment. We provided the option to withdraw from the study at any time, and promised anonymity of all data (except in the case we learned of abuse towards a child or at-risk adult, physical threat, or future criminal activity). All research was approved by our Institutional Review Board. All researchers went through the appropriate ethics and safety training to participate in research with children.

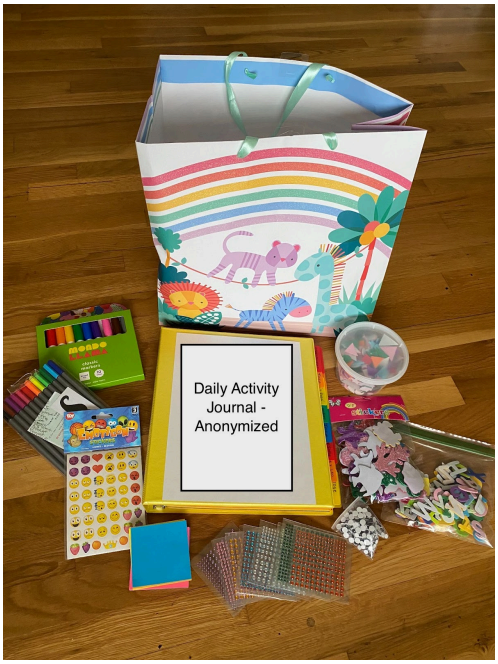
3.2 Study design

We first conducted semi-structured interviews with BVI children and their sighted guardians to capture (1) family routines and skill building within them, (2) how schools and parents communicate to address developmental skills, and (3) ideas from participants for prompts, activities, and motivations to develop independent living skills and other skills they value. These interviews were conducted either in the participants' home or on Zoom and lasted approximately 90 minutes. Children primarily participated with their mothers, although it was not a study-imposed requirement. They were occasionally joined by their fathers, step-fathers, grandparents, or siblings.

After the initial interview, we conducted a diary study. We chose to employ a diary study because of its ability to capture users' relationship with technological concepts [4], particularly in education [25], without excessive researcher intervention [8]. We created a journal for each family with 12 activity prompts. Once an interview was completed, we went through the recordings and notes to identify (1) developmental goals that were explicitly mentioned by the participant family during the interview and (2) collaborative learning routines to reflect on. We then carefully designed activities that met the following criteria: (1) Involved at least one parent, (2) could be completed in around 30 minutes or less, and (3) directly developed or reflected on a crucial goal or routine identified in the interview. The prompts also incorporated unique motivators, such as food or music, into the activities for each participant child. Some activities were repeated twice with slight modifications so families could reflect on progress between prompts.

To ensure a variety of activities and be mindful of time, we experimented with different activity documentation formats, such as checklists, reflection questions, and image uploads. We also provided participants with supplemental craft materials like markers, sticky Braille dots, and raised stickers to interact with the journal (Figure 1). The full journal prompts and responses are in the supplemental material.

Figure 1: Materials for the journal study provided to each participant family, including the binder with prompts, stickers, markers, and sticky notes.



After the two-week journaling period, we returned to the participant family's house to discuss their responses to the prompts, strategies they used, and to understand the effectiveness of the journaling and prompting framework as a developmental tool.

3.3 Data analysis

All interviews were audio and video recorded, transcribed, and qualitatively analyzed using codebooks. After interview transcription, the first author created a codebook with qualitative themes for each family. The themes defined developmental practices, future learning goals, and how the parent-teacher relationship influences learning processes. The second author parsed each developed codebook to discuss the themes with the first author and fine-tune specific codes (the code's language, if a new code needed to be added, if codes should merge, etc.). Afterward, the first author created another codebook by identifying common themes across each family's codebook. The second author similarly discussed and helped adjust the codes within this codebook.

We digitized the journal responses for thematic analysis and publication (as shown in the supplemental material). Pictures of the journal and any additional materials produced by families were retained as study artifacts.

4 Findings: Case Study Profiles

We present each participant family as a unique case study profile highlighting the family's structure, child-specific development needs, support strategies, and experiences with the journal activities. Each profile focuses on the BVI student(s) and the parent serving as the primary participant alongside the child. We also note the influence of other family members when appropriate and their involvement in the study. At the end of the profiles, we summarize the relationship families have with schools and teachers and how this facilitates learning. Table 2 maps each family to their key skills developed in the journaling activity.

Table 2: Each participant family and the skills they developed through the journaling activity. These skills were identified as important in each family's initial interview.

Family ID	*Key Developmental Skills*
Family 1	Motor skills within daily routines (brushing teeth, food preparation), non-verbal communication (physical cards, AAC device), academic skills (reading)
Family 2	Independence in daily routines (brushing teeth, getting dressed, mealtimes), communication (verbal and non-verbal), integrating technology, academic skills (math)
Family 3	Melding learning between school and home (using technology, teacher visits at home), recalling full routines, creating accessible spaces (kitchen appliances)
Family 4	Independence in daily routines (laundry, food preparation), creating accessible spaces and experiences (kitchen appliances, board games)
Family 5	Independence in daily routines (laundry, food preparation), creating accessible spaces and experiences (kitchen appliances, board games), academic skills (reading), exploring topics of personal interest

4.1 Family 1: Eloise and Jamie

4.1.1 *The Family.*

Eloise (9, F), a 4th grader at a specialized school for the blind. She has cortical vision impairment and is nearsighted. She attends physical therapy, occupational therapy, speech therapy, music therapy, and applied behavioral analysis therapy. Eloise works with a one-on-one aide at school. She participated in the study with her mother, Jamie (36, F), who is a classroom teacher. They live at home with Eloise's bilingual Spanish-speaking father (36, M) and three dogs.

4.1.2 *Developmental Goals and Skill-Building Strategies.*

The highest priority for development is furthering Eloise's communication abilities. Jamie explained that *"there is a domino effect"* with Eloise's communication skills: they impact her ability to be independent, advocate for herself, and progress in all other areas of her development. Eloise communicates primarily through gestures, vocalizations, and physical cards with images relating to objects and tasks. However, she has recently started to use an augmentative and alternative communication (AAC) device to support her non-verbal communication. The AAC device is a tablet with categories for different classes/themes (eg. music, objects at home, and objects in books she reads). The tablet uses enlarged pictures that Eloise can see. The long-term goal is for Eloise to become more comfortable using her AAC device at home, at school, and during her therapies. Jamie hopes Eloise can eventually select the images used for communication in the device and incorporate Spanish for communication with her family members on her father's side.

Eloise's independence interconnects multiple development areas, from physical coordination to communication abilities. For example, meal preparation and eating build her physical therapy skills. However, she is resistant to developing mobility skills because she finds them more challenging. Eloise requires hand-over-hand physical guidance and verbal prompting from her parents to complete her routines at home, such as getting dressed, brushing her teeth, and eating. Jamie progressively builds Eloise's routine by incorporating new tasks sequentially. *"We started with a timer and brushing her teeth. Then, we added brushing her hair independently. The next thing that we want to do with her is washing her face independently."* Jamie also uses strategies like timers, modeling how to perform tasks, and step-by-step narration to assist Eloise. For complex tasks, Eloise is encouraged to first attempt them independently. However, her parents often repeat the task for Eloise themselves to ensure it is done correctly.

4.1.3 *Journal Prompts.*

Based on Eloise's goals and needs, we designed prompts that:

- Characterized current successful skill practices at home (ex. reading together).
- Documented how parents scaled and prompted skill development (ex. brushing teeth).
- Practiced new skills the family wanted to work on (ex. learning to use technology communication aids).

For example, during the interview, we learned that Jamie and Eloise wanted to work on brushing Eloise's teeth with more independence. Accordingly, we developed the following prompt:

> **Day 1: Prompts for brushing teeth**
>
> Work with Eloise to brush her teeth and keep track of the verbal prompts that you use during this process. After she is done brushing her teeth, write down each of the verbal prompts that you gave Eloise in this journal. Note down during which parts you used physical guidance.
>
> After writing down the prompts and physical guidance cues, answer the following:
>
> - Next time you help Eloise brush her teeth, how would you change the prompts and the physical guidance (if at all)?
> - Which prompts would you remove or add?
> - Would you offer more or less physical guidance? At which points?

We also created prompts for Jamie to reflect on Eloise's challenges and her overall progress.

4.1.4 *Follow-up Interview.*

Alignment between home and school: After finishing all 12 prompts, Jamie appreciated how easily they integrated into Eloise's routines and the structure they brought to developing her goals. Her preferred prompts aligned with the goals of Eloise's speech and behavioral therapists. For example, a few prompts asked the family to identify household objects using Eloise's AAC device. This reflected the exact modeling technique the school taught Jamie to do with Eloise. *"These activities helped us put what we have been learning about into practice,"* Jamie explained.

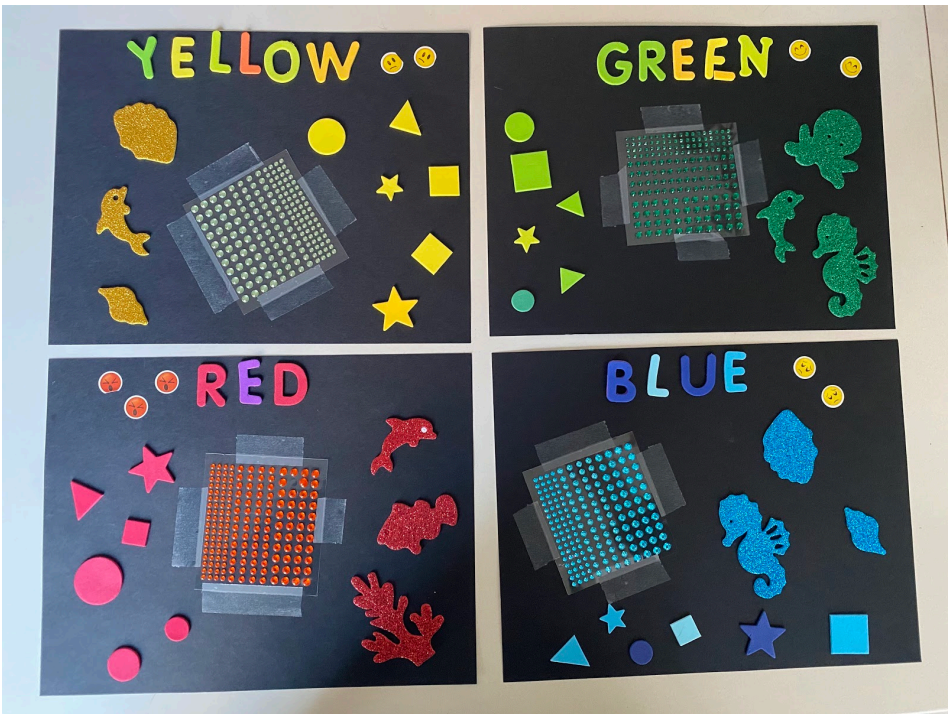
Challenges with demanding tasks and daily activities: Prompts in areas that Eloise was uninterested in, and the family did not have an existing structure for, were more challenging. Food preparation, in particular, was difficult due to Eloise's dislike of physically demanding tasks. However, Jamie emphasized the value of using food preparation to build behavioral skills, like patience, along with physical dexterity, and will continue working on them with Eloise.

While the activities set aside time for Jamie and Eloise to build crucial skills, the journal was not a necessary integration for every free period. Jamie explained that on weekend days when Eloise, herself, and Eloise's father were home, they intentionally did nothing with each other. Finding hobbies and a love for activities without the pressure of added learning is imperative for Eloise's development. While the journal activities integrated easily into routines, Jamie emphasized that they still felt like *"something extra we are going to do."* Realistically, Jamie would integrate these activities into Eloise's schedule once a week.

> "Being a parent of a child with a disability is extremely hard. There are so many enjoyable things that we do that don't feel like a task. If we were to do the AAC device during bowling, it's like we have to pull your attention from something that you like. For her age, getting her to be able to just enjoy an activity just to enjoy it…Everybody needs it."

Reflective journaling and adapting activities: Reflective prompts inspired Jamie to start regularly journaling. Journaling helped Jamie view Eloise's long-term progress more positively, as she could reflect on weekly changes rather than day-to-day struggles.

Figure 2: A tactile graphic created by Family 1. They used the additional materials we provided to create a graphic representing the zones of regulation, an emotion regulation concept Eloise is learning at school.



> "It helped me realize that not everything was negative. You don't see progress until they are done, even though there is all this progress and you're doing it every day. I do think the reflection will help to see that as a parent. Makes me feel better!"

Previous work echoes Jamie's sentiment that parents of children with disabilities may feel higher levels of *"stress"* and *"frustration"*, and emphasizes that fostering optimism in parents is crucial [22, 23].

All of Eloise's education is interconnected. This is beneficial for Jamie to support Eloise's development at home, but in turn, she is worried about being judged by teachers. Private reflection on how Eloise is doing can build *"a little separation between school and home."* Jamie and Eloise's teachers also tend to fixate on what research has deemed necessary for BVI children. The journal encouraged her to recognize that Eloise's interests may contradict these notions. *"It really is almost like collecting data."* For example, Jamie adapted prompts written by the research team to better suit Eloise's needs, such as a prompt asking the family to create a communication/task card to help with at-home daily routines, a resource they already implemented at home. Instead, she created a card that taught emotional regulation zones, reinforcing a concept Eloise was learning in school (Figure 2).

4.2 Family 2: Audrina and Justina

4.2.1 The Family.
Audrina (11, F), a 4th grader at a specialized school for the blind, is legally blind, has autism, attends applied behavioral analysis therapy, and works with a sleep specialist to manage her disrupted sleep and impacted behavior. She also works with a one-on-one aide at school. Audrina primarily participated with her mother, Justina (30, F), who is a night shift nurse. Her retired grandmother, Lola (57, F), helps care for Audrina and participated in the interviews.

4.2.2 Developmental Goals and Skill-Building Strategies.
Similar to Eloise, Audrina is developing fundamental independence skills for her routines. According to Justina, Audrina has *"come a long way in her independence"*, and has the ability to complete some basic tasks with verbal prompting and minimal physical guidance. For example, while Lola and Justina help Audrina eat hot foods and cut up larger food, Audrina eats simple meals on her own. Initially, Justina used hand-over-hand guidance with easier foods, like yogurt, to build up Audrina's motor skills, and gradually scaled up to more advanced foods. Food is a major motivator for Audrina, potentially making skills in this area easier to develop.

Despite this ability to complete tasks independently, Lola and Justina will often complete Audrina's tasks for her due to time constraints or to ensure they are done correctly. For example, Justina explained that she assists with getting dressed so they make it to school on time or to ensure she is dressed fully.

> "I don't give her the chance to do it, which you'll see a pattern of. There are some things she can do. It's just for whatever reason, I do them. I don't know if it's a habit. Well, I guess because we're crunched for time, getting ready in the morning. I could totally back off."

This barrier was common across families and inspired multiple prompts explicitly instructing parents to scale back assistance during skill-building.

Like Eloise, improving communication is imperative for Audrina's safety and boundary setting. Justina wants Audrina to practice communicating her needs through words and the audio buttons she installed in their home, rather than shouting. Audrina struggles to communicate when she transitions between activities. This is an area her behavioral therapy focuses on. Justina purchased a bear with an associated mobile application to help Audrina with transitions. However, because pre-programming the bear is time-intensive on Justina's end, she has not yet utilized the bear. Instead, she talks through events and routines with Audrina, shows her YouTube videos, and plays games relating to the event (ex. playing operation before going to the doctor).

Audrina does not have homework but still practices literacy and math skills at home. Audrina and Justina collect and read books together, a passion that Justina has shared with her daughter. They own a huge collection of adapted books with Braille and tactile elements that connect to the story, along with stuffed animals that play recorded stories through built-in speakers. Justina follows the school's advice to do activities that contextualize the books they read at home, such as going to a petting zoo so Audrina can interact with the animals she is reading about.

Justina uses food to motivate Audrina to work on math, modeling how teachers motivate Audrina during math lessons at school. Justina elaborated, *"We try to do activities consistent with what she does at school because I find she gets frustrated if I do something else and then they're doing something else."* She also explained that Audrina tends to perform better on these academic-related activities at school than she does at home.

4.2.3 *Journal Prompts.*

Based on Audrina's goals and needs, we designed prompts that:

- Encouraged Justina to give Audrina more room to exhibit independence (ex. getting dressed).
- Characterized challenges with skill development (ex. what makes certain tasks more difficult).
- Developed new skills the family outlined as important (ex. meal preparation).

We also created prompts for Justina and Lola to reflect together on Audrina's challenges and overall progress.

4.2.4 *Follow-up Interview.*

Supporting independence and learning to *"back off"*: Prompts that incorporated Audrina's motivators went exceedingly well. For example, she was particularly engaged in meal preparation activities. The provided recipes, such as making a mug cake, matched Audrina's skill level and interest. *"I don't know if it's because it was a smaller mug, but she had more control over it. Usually, she walks off. She stayed the full time. I saved the recipe!"* Being involved in preparation helped Audrina build patience before mealtimes when usually she would become irritated while waiting.

The journal also prompted Justina to scale back her assistance during activities she suspected Audrina could do by herself, such as getting dressed. Justina and Lola were shocked at Audrina's ability to completely dress herself in under two minutes. Justina explained that these activities, combined with reflective prompts on Audrina's progress over longer periods, showed her how independent Audrina could be.

Enjoying and continuing activities beyond the study: Due to the success of food preparation activities, Justina plans to regularly involve Audrina in weekend meal preparation when they have fewer time constraints. She also plans to combine food preparation with other skill-building areas, such as math. For example, a prompt asked the family to practice counting using food that Audrina enjoys. Justina made chocolate-covered banana bites to motivate Audrina in her counting practice. In the next iteration of this activity, she will have Audrina participate in the preparation of the snack that she will then count.

Justina viewed the binder activities as a way to bond with Audrina and asked if we could provide her with more prompts at the end of the study. Justina and Audrina continued to use the materials we provided after the study, such as crafting as a way to reflect on a book they were reading (Figure 3). Contrasting Family 1 feeling that the prompts were not always compatible with their downtime, Justina and Lola felt the prompts did not feel like schoolwork, making it an enjoyable bonding experience for all of them. While Justina loved having a physical binder to keep in the living room, she explained she would be interested in a mobile application that prompted activities on a routine schedule and provided areas for tracking and reflection.

> "There's not anything out there, or that I know of, that as a parent you can work on daily living skills with your child with. I could see it not only for parents with kids with disabilities, but even toddlers. Not only is it daily living skills, but it's fun things, like that mug[cake]. It's an independent living skill, but covered with fun."

4.3 Family 3: Talia and Gisele

4.3.1 *The Family.*

Talia (11, F), a 6th-grader at a specialized school for the blind, is completely blind in her right eye and nearsighted in her left eye. Talia attends occupational therapy, physical therapy, orientation and mobility training, and sees a Speech-Language Pathologist. After the initial interview, Talia underwent foot surgery. She was on bed rest for six weeks, including during the journaling portion of the study and follow-up interview.

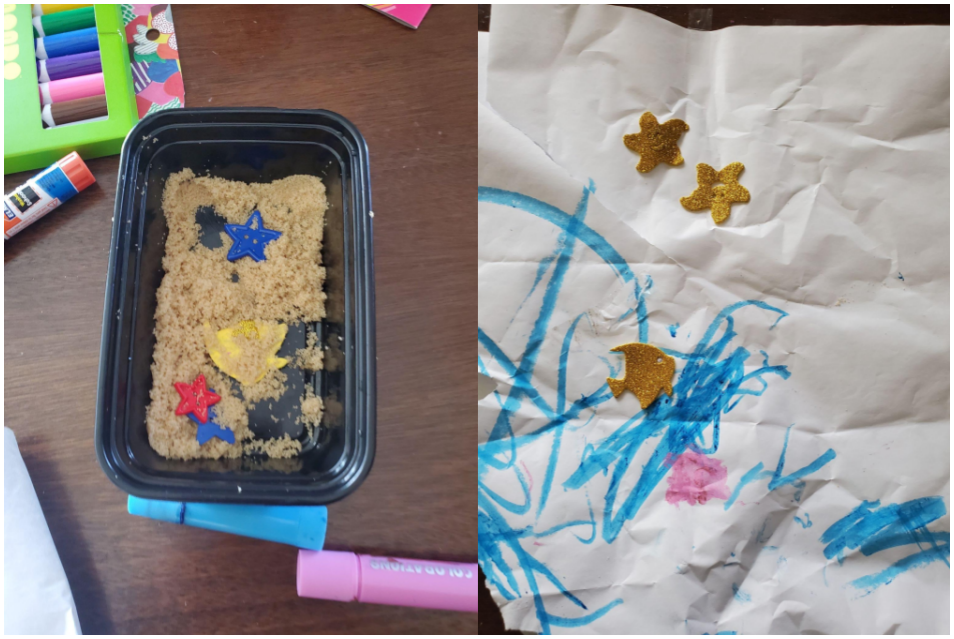
Gisele (44, F), Talia's mother, works in healthcare and primarily participated in the study with Talia. Talia's father, Joe (52, M), and her brother, Jared (13, M), joined for a portion of the initial interview. Joe is partially blind from an injury and wears glasses.

4.3.2 *Developmental Goals and Skill-Building Strategies.*

Talia has developed the physical skills required for basic tasks, such as brushing her teeth, setting the table, and pouring drinks. However, like Audrina, she requires assistance to do tasks correctly and completely. While Talia has progressed in her independence, Joe explained that she requires verbal prompting to tell her when to do each activity. Gisele added that they often need to encourage her and remind her she is capable of being independent.

Some routines raise safety concerns for the family. For example, while Talia can maneuver basic tasks in the kitchen, her parents

Figure 3: Crafts that Justina completed during a reading activity with Audrina after the study had finished. She texted the research team the images and said: "We listened to some stories about the ocean and the starfish. Used brown sugar for sand and drew a picture of the ocean with starfish."



worry about the accessibility and safety of more complex appliances, like the stove. Gisele hopes she and Talia can work together to make kitchen appliances accessible and safely advance to new skills.

The family uses leisure activities and hobbies to build important life and ECC skills. Talia plays basketball with her brother to develop orientation and mobility skills. The family goes on picnics and works with Talia on simple meal prep, such as making sandwiches and grabbing cutlery and napkins for the outing. The family's goal is to continue developing the foundation of independence and academic skills that Talia has built over the last five years.

School provides Talia with a laptop to practice typing, listen to audiobooks, and develop computer navigation skills using a screen reader. Using technology, particularly with voice-over and audio feedback, motivates Talia and is often used as a reward. In addition to audiobooks, Gisele reads to Talia and they discuss books together. The family uses educational videos on YouTube to make learning more fun. For math, Talia uses a laminated sheet with Velcro stickers to attach numbers and create decimal values. Her math teacher uses this same learning strategy during lesson plans in school and provides her with similar tools to use at home.

4.3.3 *Journal Prompts.*

Due to Talia's foot surgery, she was on bed rest for the journaling portion of the study. However, we believe this presented a unique opportunity to study how learning adapts to unavoidable life changes.

Based on Talia's goals and needs, we designed prompts that:

- Documented the phases of developing a skill (ex. brushing teeth).
- Captured how Talia's teachers instructed her at home during her recovery (ex. weekly lessons).
- Developed new skills the family outlined as important (ex. improving memory and recalling routines).

We also wrote prompts for Gisele to reflect on Talia's challenges and progress.

4.3.4 *Follow-up Interview.*

Encouraging child-led activities: Gisele commended the prompts for aligning with skills Talia was working on and loved the physical binder format for reflection. Despite Talia's recovery limiting her mobility, Gisele encouraged Talia to select her daily activities and take an active role in leading them. For example, for a prompt of creating accessible kitchen labels, Talia brainstormed where to place labels around the kitchen, designed the labels, and placed stickers on them while telling her mom what to write on the labels. Gisele emphasized that she was careful never to tell Talia that the activities were something they *had* to do, which made them feel less like work.

Retaining skills and the relationship between home and school: The prompts and follow-up interview captured how school and home learning environments merge to support students in special circumstances. Talia had two teachers, Rachel and George, visit the house weekly to work on literacy and math. They both brought classroom technology home for Talia to use during the week to keep up with her computer skills and the concepts they support, such as typing, math, and literacy. Their goal was to continue practicing skills Talia had learned in person, rather than introducing new concepts while at home.

As highlighted earlier, Talia struggles with recalling the steps of her routines. These routines are informed in part by Talia's independent living skills teacher, who provides Gisele with a list of tasks to continue practicing at home. In return, Gisele expects Talia's teachers to reinforce Talia's routines and monitor her needs at school. While instructors visiting the home is a unique accommodation, this intimate relationship between school and home is well established.

4.4 Family 4: Morgan, Chloe, and Amanda

4.4.1 The Family.
Morgan (11, M) is a 6th grader in the public school system. His sister Chloe (9, F) is a 4th grader also in the public school system. Morgan is legally blind (20/400), while Chloe's weaker eye is at 20/200. Their mom, Amanda, is a nurse practitioner and practice owner with 20/20 vision. She primarily participated in the study, while her husband Mark (49, M) joined for journal activities and the final interview.

4.4.2 Developmental Goals and Skill-Building Strategies.
Amanda described Chloe and Morgan as *"pretty self-sufficient."* They wake up on their own, dress themselves, brush their teeth, brush their hair, and get ready for the day entirely independently. They do their homework alone, usually only asking for help when they want their answers to be checked. However, it takes adaptation and practice to ensure this level of independence. Amanda explained,

> "It's all of us working collaboratively. It's a matter of making it accessible. We tend to use a lot more spoons than forks because it's just easier. We tailor it a little to them."

Amanda and her husband also use verbal strategies to make everyday activities accessible for Chloe and Morgan. For example, when Morgan plays video games, they will read relevant text displayed on the screen out loud to him. The family prioritizes watching movies Morgan and Chloe have read the book versions of so they have context. Amanda and her husband will also narrate the scenes.

Morgan uses technology to make his hobbies more accessible. He listens to YouTube videos to learn how to set up different tools, like using Amazon's Alexa to control the lights and wake him up. Access to technology has also rapidly improved Morgan's education experience, especially since remote learning and COVID-19. Learning to use advanced tools, like a refreshable Braille display, was Morgan's key to doing school work without constant support.

Technology has proved less helpful for functional skills at home, like food preparation and chores. Seeing AI [55], a descriptive audio application from Microsoft, did not work for Morgan, as there was not enough color contrast in the kitchen and on food items for the application to detect them effectively. Amanda bought a device to place in vessels and beeped when liquid was at the top, but the tool quickly became faulty and beeped incessantly. Once technology had failed, Amanda attempted to craft tools to make the kitchen accessible, such as tactile markers, but found these were temporary solutions that often fell off.

Despite accessibility challenges in the kitchen, basic meal preparation skills are essential for Chloe and Morgan and are prominent in their Individualized Education Programs. Amanda hopes that Chloe and Morgan can further their independence with other household chores as well, like laundry, cleaning their rooms, and doing the dishes. While Chloe and Morgan have the baseline skills to embark on these activities, Amanda said she and her husband tend to *"help maybe more than we should"*, similar to previous families.

4.4.3 Journal Prompts.
Based on Chloe and Morgan's goals, we designed prompts that:

- Documented the phases of developing a skill they had mastered (ex. brushing teeth).
- Considered Chloe and Morgan's shared experience of vision impairment and unique strengths (ex. Chloe teaches Morgan about baking, Morgan teaches Chloe about technology).
- Developed new skills the family outlined as important (ex. doing laundry).

We also created prompts for Amanda to reflect on her goals for Chloe and Morgan, and for the family to brainstorm activities to reach these goals.

4.4.4 Follow-up Interview.
Encouraging development and anticipating barriers: The journal successfully prompted Family 4 to develop skills in their backlog. Having a structure for developing their goals enabled the family to identify accessibility challenges in activities earlier. Amanda and Mark labeled their usual approach to teaching new skills as *"trial and error"*, but remarked that using a framework like the binder "*would have made us think about these activities and how to make them accessible way earlier than we did."* Morgan then exclaimed, *"they just teach us as we go!"*

Amanda explained that their instinct is to do things *"by habit"*, but reflecting on a prompt developing laundry skills made them consider how their previous strategies may not pan out for new activities. In particular, a challenge for Morgan was pouring soap into the cup for the washing machine. Mark said, *"normally when he's filling a liquid in a cup, he just puts his finger down in there. I don't want him doing that with soap or dish detergent."* After completing the activity, the family brainstormed a new strategy for Morgan and Chloe to check liquid levels: counting while pouring.

Challenges with learning from family: Chloe and Morgan presented the unique opportunity for sibling interaction during learning. They have similar learning goals, but Morgan often develops the skill right before Chloe, as he is a few years older than her and has less visual acuity. However, Amanda explained that for skills the children are already reluctant to do, learning from a sibling is hard. Chloe added, *"You are not allowed to listen to your brother! It's just not possible, it's a rule."* Reflecting on homework time in the journal, Amanda noted again that Chloe *"tends to be more resistant when we ask her to do work than when her teachers do."* This parallels sentiments from Family 1 and 2 who said their children tended to act and perform better at school than at home.

Celebrating progress and long-term adoption: Amanda and Mark found that the binder helped them celebrate skills they previously developed. *"I think it was good to give us a little reinforcement that we are doing an okay job of teaching some stuff,"* Amanda said. The similarity of prompts with activities they had been doing as a family, along with reflecting on past skill development, helped them feel as if they were on the right track with their children's development.

Amanda found that the prompts naturally fit into the family's schedule. They often did the activities during their allotted family *"hangout time"* before dinner, similar to Family 2 using the activities during their bonding time. However, Amanda explained it was not possible to do a prompt every day. Amanda loved the physical format of the binder, but Morgan disagreed. Instead, he advocated for an accessible phone application with voice-over. Amanda admitted that a technology-integrated tool would help them be more regular about doing skill development activities.

4.5 Family 5: Daisy and Catherine

4.5.1 The Family.
Daisy (10, F) is a 5th grader in the public school system. Her visual acuity (20/200) has improved during her childhood. However, her mother Catherine (35, F), said her acuity will likely lower through adulthood. Catherine is a teacher for BVI children in the public school system. Catherine has corrected vision with glasses and can read Braille. Daisy splits her time, along with her siblings, Eric (8, M) and Amber (6, F)), between two homes. The first home is with Catherine, her husband Adam (46, M), who Daisy calls *"Bonus Dad"*, and her sister Rory (10 months, F). Adam participated in the interviews and some of the journal activities. The second home is with Daisy's father, Barry (45, M), and his wife Lucy (37, F). Barry lost his vision in adulthood, and his visual acuity is around 20/400.

4.5.2 Developmental Goals and Skill-Building Strategies.
Similar to Family 4, Daisy has developed the foundation for many skills. She wakes up on her own, makes herself a simple breakfast, brushes her teeth, eats, gets dressed, cleans, and does chores. She enjoys helping her siblings with breakfast, their schoolwork, and changing diapers. Catherine described an example of how she scaled support to develop these skills with Daisy:

> "When she was younger, we would do reverse chaining. I would put her shirt on and she would push her arm through the hole. I would start with the more difficult part of the task and then have her work on the little things. She couldn't zip her jacket, so I would start with it and she'd pull it up all the way. Slowly but surely, she started putting it together."

Now, Daisy's goal is to advance her skills. She has started to work with Adam on using kitchen appliances, such as the stand mixer and safe hand placement on a stove. Catherine and Adam would like her to be able to use an appliance to make a full meal independently, such as heating a breakfast burrito in the microwave or using the toaster for sandwiches. They also explained that while Daisy has built individual skills, they want her to complete full routines on her own. For example, Daisy can take her laundry hamper up and down the stairs, but cannot do a complete laundry cycle yet. She can set the table and identify cutlery, but cannot do a dishwasher cycle. These longer routines aggregate the sub-tasks Daisy can do and seem to be the next crucial step in her development.

Catherine explained that a major family goal is to cultivate a healthy and positive perception of vision impairment with Daisy and her siblings. She described how Daisy's siblings steal her magnifiers thinking they are toys, or get annoyed at Daisy for holding their picture books too close to her eyes while reading to them. Catherine tries to describe blindness to Daisy's siblings but acknowledges they might be too young to fully grasp it. Their family is also Christian which influences the belief that *"Daisy was born exactly the way she was supposed to be and she gets to see the world in a unique way. We really encourage her to embrace that."* However, Catherine emphasized that while they are proud of Daisy's abilities, they wish social interaction, with sighted people particularly, was more emphasized in the ECC.

4.5.3 Journal Prompts.
Based on Daisy's goals, we designed prompts that:

- Documented the phases of developing a skill she has mastered (ex. brushing teeth).
- Developed strategies for skills Daisy found challenging (ex. tying her shoes).
- Encouraged new skills the family outlined as important (ex. exploring kitchen appliances).

We also created prompts for Catherine to reflect on goals for Daisy and brainstorm activities to reach these goals.

4.5.4 Follow-up Interview.
Building confidence and accessibility adaptations: The journal encouraged Family 5 to develop skills in their backlog, consistent with other families in the study. Catherine explained that doing the journal activities also built Daisy's confidence in her ability to pick up and execute tasks, such as when she made lunch for herself and her siblings during a meal preparation activity from the journal. Daisy displayed this confidence by teaching her siblings the skills she learned during the study. Cooking is also an activity the entire family enjoys and bonds over regularly, potentially contributing to Daisy's excitement at successfully making a meal.

Journaling and reflecting prompted the family to think about new skills and activities that should be made accessible. For example, during the follow-up interview, Daisy offered first-aid as a development area that could be added to the journal. Catherine used the stickers we provided to make the laundry machine accessible and theorized the same strategy would be successful for other household appliances, such as the oven and microwave. She also loved that the accessible adaptations benefited all members of the family, not just Daisy. *"This goes into universal design. I think it will be beneficial for [her siblings] too because they can't read all of the words on there."*

Documenting challenging skills: The activities confirmed which skills tended to be more difficult for Daisy to develop. Like Family 1, tasks involving fine motor skills take longer and can be frustrating to learn, particularly when Daisy's peers pick the skills up faster, Catherine explained. Daisy also tends to listen to her father more patiently during skill building, as he is also visually impaired, and she feels that he understands her. However, the journal helped Catherine understand the threshold for Daisy's patience and when to finally encourage her to use her residual vision.

4.6 School Communication and Parent-Teacher Dynamics

Each family is given an Individualized Education Program, defining academic, behavioral, and functional milestones. These plans are extensive and contain a multitude of goals that need to be addressed

both at school and at home. Families have developed strategies for addressing these skills. For example, Jamie and her husband categorized the education program areas and have started to design activities that combine multiple goals into activities they can implement at home, inspiring our journal activities that similarly addressed multiple skills simultaneously. Jamie elaborated,

> "Between the different therapies and academics, we wanted to be more intentional at home. We printed out her goals and I color-coded them for what the different therapies are. We're trying to group them and create activities at home because it's not feasible or reasonable for her to do an activity for every single goal that she has. For example, for [occupational therapy], one of the things was to get her to use her fine motor skills of putting coins inside of a piggy bank. But it also could go with her math goal of addition and subtraction."

Despite schools providing students with yearly milestones, all parents said they identified skills their child needed to work on from observation and an understanding of their child. However, Amanda (Family 4) explained that standardized lists of independent living skills would be helpful so they can get a *"leg-up"* on skills their children will have to develop in the future. Catherine (Family 5) agreed that parents in the public school system, those with BVI children and those without, could use more guidance for independence and behavioral targets:

> "I don't think anybody sits down with any of us and says, *'your kid is at this age and should be doing this sort of chore.'* What are age-appropriate expectations so that we are raising adults who know how to do things later on in life? I don't think there's a lot of great information, I don't get any from the school."

Parents are in constant communication with their child's school about behavioral and academic progress at home. In parent-teacher conferences, Justina (Family 2) updates the school on home learning and gives input on what Audrina can develop further at school. Gisele and Joe (Family 3) talk to Talia's teachers multiple times a week and are updated on her progress and the skills she needs help with. During the interview, Amanda frequently referenced Morgan and Chloe's Individualized Education Programs and described having a close relationship with her children's vision teachers. *"They are part of our family. They are our bridge to everything."*

While Family 1 desired some separation from school during skill development, Catherine (Family 5, and a teacher for visually impaired children) advocated for teachers to have complete access to *all* learning progress at home. She explained that teachers often intervene with at-home learning to help parents avoid *"learned helplessness,"* admitting that Daisy's teacher has instructed her on when she needs to scale back her assistance. Parents want their children to be independent, but there can be a *"poor blind kid mentality,"* Catherine explained. This mindset is reflected in previous research [53], and inspired prompts scaling back assistance in the journal activities we provided to families.

5 Discussion

The case studies highlight skill development strategies and goals for blind or visually impaired (BVI) children with consideration of their family support systems, routines, and parent-teacher communication. This study demonstrates that playful activities and prompts customized to BVI children's current routines effectively engaged them in the learning process and encouraged parents to develop skills they had been hoping to address with their children.

There were commonalities across families concerning the intimate relationships between parents and teachers, the tendency to over-assist children, reflection positively affecting perceptions of development, and prompts developing backlogged skills. Families also provided a set of strategies to scale activities to support skill development. In the discussion, we contemplate how technology supporting independent living skill development at home could be designed around these commonalities, and scaled by leveraging emerging tools.

5.1 Designing and scaling at-home learning tools to build on existing routines

Aligning with previous research on educational technology for BVI children [11], our participants found that prompts built upon their existing routines, goals, and school activities integrated easily into their lives and felt like fun, bonding activities. The prompts encouraged development through consistency for skills that families already had experience with. Many families applauded the tool for pushing them to develop skills on their backlog.

However, as Family 1 explained, activities that families did not have previous structure for were more difficult to integrate. For example, practicing physical skills during cooking was completely new territory for Family 1. While they saw the value in the activity itself, they struggled to execute it without prior experience. Jamie (Family 1) even adapted one of our prompts to be more reflective of concepts they were already working on, as shown in Figure 2. Gisele (Family 3) explained that when teachers provide tools and activities for home learning, their goal is to maintain development, not teach new skills. Justina (Family 2) similarly shared that her daughter becomes frustrated if they do activities that deviate too much from what she has done in school. These findings suggest that ECC tools meant for home use should target routines that users have an existing structure for. Developmental systems that introduce entirely new environments and activities, while still valuable and useful, may be better suited for academic environments or when teachers can provide initial guidance.

Developing these nuanced activities is a laborious process, made possible in this work due to the small and dedicated researcher and participant groups. While generative AI tools were less ubiquitous and advanced at the time of this research, the current state-of-the-art could help scale activity generation and reduce the complexity and time intensity of the design process. Our design process used a set of parameters to build each activity, as described in the methodology. Each activity involved at least one parent, could be completed in around 30 minutes or less, and directly addressed or reflected on a crucial goal or routine identified in the interview. Families could reflect to identify similar parameters that are conducive to their routines and explore prompt engineering to generate activities

based on the desired developmental skills. This self-led process may also provide the autonomy and privacy families desire.

5.2 Empowering parents and facilitating teacher communication

Parents viewed their close relationship with teachers mostly positively and were appreciative of their attention. However, parents also self-identified many goals for their children to work on at home, including ones connecting to their cultural values and personal hobbies. Family 1 aimed to incorporate Spanish into their children's communication, while Family 5 hoped to integrate religion into literacy practices. Many parents hoped their child would develop skills and an interest in areas they personally found interesting as a way to bond, such as cooking, music, and reading. Parents also employed unique strategies to build independence, including incorporating their children's favorite foods into academic activities, scaling physical guidance to build skills requiring dexterity, and creating games and crafts around Braille. These strategies demonstrated parents were experts in creating learning experiences customized to their children, progressing development, and addressing multiple skills with single activities. This finding contributes to literature emphasizing the integral perspective parents provide on children with disabilities [9, 12, 16, 30, 59].

There are two needs here that technology design can consider: (1) Empowering parents to identify skills on their own, find activities that align with existing home routines, implement their expert strategies for skill-building activities, and privately reflect on their child's progress. (2) Allowing teacher input when parents desire it, such as eliciting ideas for skill development activities that are consistent with those in the classroom.

For example, families 2 and 4 suggested a mobile application that prompts activities and reflections as the journal did. This application could re-frame parents as experts in their children's learning by allowing them to enter independent living skill goals and personal cultural values into the application and receive customized prompts in return, without any explicit teacher input. Family 1 explained that there are already extensive systems in place for teachers to track their children's learning. An application that allows for private reflection and tracking without fear of judgment can be cathartic for parents, and create space between home and school when needed.

However, because of the existing intimate relationships between these environments, technology design should consider collaborative features that offer teacher input in a way parents can control. For example, during Individualized Education Program meetings or parent-teacher meetings, parents can elicit ideas for activities that correspond to their children's program goals. They can then selectively add activities to a bank to draw from, in addition to the activities they design on their own. We also saw that across families, children performed better at school and preferred to listen to their teachers over their parents or siblings, except in the case where a child could relate to a parent who was also visually impaired. This potentially reflects previous research that asserts home is a more "negotiable" environment than school [33]. It also might suggest that children are more willing to receive instruction in an environment that feels more relatable to their vision impairment. Features that incorporate sending progress tracking reports to teachers, or allowing teachers to send messages to families, can motivate children to take skill-building seriously and legitimize home instruction for them.

5.3 Reflecting for optimism, encouraging independence, and understanding development phases

Reflection proved to be a powerful component of the journal. Parents explained that reflecting on their children's development weekly allowed them to move past the day-to-day challenges they encountered with their routines and appreciate overall positive progress instead. Reflecting on past development also empowered them to celebrate how far they had come as a family and provided assurance they were on the right path in building independence. Incorporating thoughtful, open-ended questions about progress in tools aiming to build skill development can help parents move beyond metrics and think about their children holistically and optimistically.

Reflective questions after activities helped parents realize how independent their child can be when given space. For example, Family 2 was surprised when their child dressed herself independently, a task they had always supported. All families tended to over-assist their children due to time constraints or because their children would make small mistakes, like not aligning their pants in the middle when getting dressed. Catherine (Family 5), a teacher for visually impaired children, corroborated this sentiment and explained that a main goal of educators is to reduce parental help at home, reflected by prior education research [53]. If prompts in future tools explicitly encourage parents to scale back their assistance and provide a space for them to reflect on developmental processes, children could gain independence more rapidly.

In the journal, parents reflected on past skills and described how they phased development for different routines, such as brushing their hair and getting dressed. Their strategies included scaling back physical guidance, introducing a new task to master at each phase, and incorporating fun ways for children to provide input, such as picking out tools needed for the routine. The journal also provided insight into the forms of guidance parents provide in earlier stages of development, such as hand-over-hand strategies, modeling to encourage mimicry, and step-by-step narration during activities. When designing prompting schemes, designers can mirror these real phases of development that parents have successfully employed by referencing specific strategies at each phase. Creating this reference could also address the need for standardized, age-appropriate milestones, a desire we saw among families.

6 Limitations and Future Work

In this work, we centered parent perspectives in their children's learning, but tried to highlight children's opinions whenever possible. Some of our child participants communicated non-verbally, so we had their parents interpret their behavior as feedback about the journal activities. We also collected vocal feedback from children who communicated verbally. However, this variance made it difficult to highlight child perspectives across families to the same extent we did with parent perspectives. Future studies can investigate how to formalize feedback from children who are both non-verbal and verbal so their preferences are reported consistently.

The prompts used in this study explored how framing lived experiences can inform activity design for children. However, this was possible through a small participant group (five families) and prompts designed through in-depth interviews with each participant family. This is a time and resource-intensive approach. As mentioned in the discussion, generative AI tools could help scale activity generation and reduce the overhead time needed for each family. Future work can study the efficacy of families using reflection to self-identify developmental skills and define parameters for activities that are compatible with their lifestyles, and the adoption of these activities over time. Researchers can also start to standardize grade and age-appropriate expectations, common family goals, and Expanded Core curricular goals to an open-source dataset with corresponding activities for other families and institutions to access.

7 Conclusion

Through interviews and an activity prompting tool, this work characterized how parents and children collaborate to develop independent living skills within their routines. Customized prompts specifying levels of parental support encouraged parents to reduce their assistance and enable their children to be more independent. Building reflection into the prompts allowed parents to view their children's progress positively and feel validated in how they instruct their children. Participants enjoyed the activity framework as a bonding tool, appreciated its integration with their existing practices, and emphasized the need for technology-integrated applications that can continue similar prompting with grade and age-appropriate developmental activities.

Acknowledgments

We thank our participants for their time and support of this work. This work was funded by the National Science Foundation Graduate Research Fellowship under grant DGE 1650115. Any opinions, findings, conclusions, or recommendations expressed in this work are those of the authors and do not necessarily reflect those of the National Science Foundation.

References

[1] Donnie Adams, Alma Harris, and Michelle Suzette Jones. 2018. Teacher-parent collaboration for an inclusive classroom: Success for every child. *MOJES: Malaysian Online Journal of Educational Sciences* 4, 3 (2018), 58–72.

[2] Martin Agran, Sunggye Hong, and Karen Blankenship. 2007. Promoting the self-determination of students with visual impairments: Reducing the gap between knowledge and practice. *Journal of Visual Impairment & Blindness* 101, 8 (2007), 453–464.

[3] Kevin Allain, Bas Dado, Mick Van Gelderen, Olivier Hokke, Miguel Oliveira, Rafael Bidarra, Nikolay D Gaubitch, Richard C Hendriks, and Ben Kybartas. 2015. An audio game for training navigation skills of blind children. In *2015 IEEE 2nd VR workshop on sonic interactions for virtual environments (SIVE)*. IEEE, 1–4.

[4] Jessica Blaynee, David Kreps, Maria Kutar, and Marie Griffiths. 2016. Collaborative HCI and UX: longitudinal diary studies as a means of uncovering barriers to digital adoption. In *Proceedings of the 30th international BCS human computer interaction conference*. BCS Learning & Development.

[5] Joseph R Boyle and Michael J Kennedy. 2019. Innovations in classroom technology for students with disabilities. *Intervention in School and Clinic* 55, 2 (2019), 67–70.

[6] Coral Campbell and Beverley Jane. 2012. Motivating children to learn: The role of technology education. *International Journal of Technology and Design Education* 22 (2012), 1–11.

[7] Giulia Cappagli, Sara Finocchietti, Elena Cocchi, Giuseppina Giammari, Roberta Zumiani, Anna Vera Cuppone, Gabriel Baud-Bovy, and Monica Gori. 2019. Audio motor training improves mobility and spatial cognition in visually impaired children. *Scientific reports* 9, 1 (2019), 3303.

[8] Scott Carter and Jennifer Mankoff. 2005. When participants do the capturing: the role of media in diary studies. In *Proceedings of the SIGCHI conference on Human factors in computing systems*. 899–908.

[9] Margo Collier, Elizabeth B Keefe, and Laura A Hirrel. 2015. Listening to Parents' Narratives: The Value of Authentic Experiences with Children with Disabilities and Their Families. *School Community Journal* 25, 2 (2015), 221–242.

[10] Erin C Connors, Lindsay A Yazzolino, Jaime Sánchez, and Lotfi B Merabet. 2013. Development of an audio-based virtual gaming environment to assist with navigation skills in the blind. *JoVE (Journal of Visualized Experiments)* 73 (2013), e50272.

[11] Luigi F Cuturi, Elena Aggius-Vella, Claudio Campus, Alberto Parmiggiani, and Monica Gori. 2016. From science to technology: Orientation and mobility in blind children and adults. *Neuroscience & Biobehavioral Reviews* 71 (2016), 240–251.

[12] Sarah J Denman. 2014. Parents as experts on children with disabilities: Being prepared for the long-haul. *International Journal of Disability, Development and Education* 61, 4 (2014), 434–440.

[13] Council for Exceptional Children. 2009. *What every special educator must know: Ethics, standards and guidelines*. Council Exceptional Children.

[14] Vinitha Gadiraju, Annika Muehlbradt, and Shaun K Kane. 2020. Brailleblocks: computational braille toys for collaborative learning. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. 1–12.

[15] Ian Glover. 2013. Play as you learn: gamification as a technique for motivating learners. In *Edmedia+ innovate learning*. Association for the Advancement of Computing in Education (AACE), 1999–2008.

[16] Jay A Goddard, Ron Lehr, and Judith C Lapadat. 2000. Parents of children with disabilities: Telling a different story. *Canadian Journal of Counselling and Psychotherapy* 34, 4 (2000).

[17] Christa L Green, Joan MT Walker, Kathleen V Hoover-Dempsey, and Howard M Sandler. 2007. Parents' motivations for involvement in children's education: An empirical test of a theoretical model of parental involvement. *Journal of educational psychology* 99, 3 (2007), 532.

[18] Ted S Hasselbring and Candyce H Williams Glaser. 2000. Use of computer technology to help students with special needs. *The future of children* (2000), 102–122.

[19] Phil Hatlen. 1996. The expanded core curriculum for students with visual impairments, including those with additional disabilities. *RE: view* 28, 1 (1996), 25–32.

[20] Phil Hatlen. 2012. Origins of the Expanded Core Curriculum. (2012).

[21] PD Hatzigiannakoglou and MT Kampouraki. 2016. " Learn Braille": A Serious Game Mobile App for sighted Braille Learners. *Journal of Engineering Science and Technology Review* 9, 1 (2016), 174–176.

[22] Tali Heiman. 2002. Parents of children with disabilities: Resilience, coping, and future expectations. *Journal of developmental and physical disabilities* 14 (2002), 159–171.

[23] Yun-Ju Hsiao. 2018. Parental stress in families of children with disabilities. *Intervention in school and clinic* 53, 4 (2018), 201–205.

[24] Rabia Jafri. 2014. Electronic braille blocks: a tangible interface-based application for teaching braille letter recognition to very young blind children. In *Computers Helping People with Special Needs: 14th International Conference, ICCHP 2014, Paris, France, July 9-11, 2014, Proceedings, Part II 14*. Springer, 551–558.

[25] Tuomas Kari, Eeva Kettunen, Panu Moilanen, and Lauri Frank. 2017. Wellness technology use in everyday life: a diary study. In *Bled eConference*. University of Maribor Press.

[26] Varsha Koushik, Darren Guinness, and Shaun K Kane. 2019. Storyblocks: A tangible programming game to create accessible audio stories. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. 1–12.

[27] Charalampos Kyfonidis, Nektarios Moumoutzis, and Stavros Christodoulakis. 2017. Block-C: A block-based programming teaching tool to facilitate introductory C programming courses. In *2017 IEEE Global Engineering Education Conference (EDUCON)*. IEEE, 570–579.

[28] Suk-Hyang Lee, Susan B Palmer, Ann P Turnbull, and Michael L Wehmeyer. 2006. A model for parent-teacher collaboration to promote self-determination in young children with disabilities. *Teaching Exceptional Children* 38, 3 (2006), 36–41.

[29] Keri Lohmeier, Karen Blankenship, and Phil Hatlen. 2009. Expanded core curriculum: 12 years later. *Journal of Visual Impairment & Blindness* 103, 2 (2009), 103–112.

[30] Hailey R Love, Alison L Zagona, Jennifer A Kurth, and Amanda L Miller. 2017. Parents' experiences in educational decision making for children and youth with disabilities. *Inclusion* 5, 3 (2017), 158–172.

[31] Maruricio Lumbreras and Jaime Sánchez. 1999. Interactive 3D sound hyperstories for blind children. In *Proceedings of the SIGCHI conference on Human Factors in Computing Systems*. 318–325.

[32] Marcella Mandanici and Antonio Rodà. 2020. Large-Scale Interactive Environments for Mobility Training and Experience Sharing of Blind Children. *Technological Trends in Improved Mobility of the Visually Impaired* (2020), 301–318.

[33] Berry Mayall. 2014. Children in action at home and school. In *Making Sense of Social Development*. Routledge, 199–213.

[34] Lotfi B Merabet and Jaime Sánchez. 2016. Development of an audio-haptic virtual interface for navigation of large-scale environments for people who are blind. In *Universal Access in Human-Computer Interaction. Users and Context Diversity: 10th International Conference, UAHCI 2016, Held as Part of HCI International 2016, Toronto, ON, Canada, July 17-22, 2016, Proceedings, Part III 10*. Springer, 595–606.

[35] Lauren R Milne, Cynthia L Bennett, and Richard E Ladner. 2013. VBGhost: a braille-based educational smartphone game for children. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. 1–2.

[36] Lauren R Milne, Cynthia L Bennett, Richard E Ladner, and Shiri Azenkot. 2014. BraillePlay: educational smartphone games for blind children. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. 137–144.

[37] Lauren R Milne and Richard E Ladner. 2018. Blocks4All: overcoming accessibility barriers to blocks programming for children with visual impairments. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. 1–10.

[38] Austin M Mulloy, Cindy Gevarter, Megan Hopkins, Kevin S Sutherland, and Sathiyaprakash T Ramdoss. 2014. Assistive technology for students with visual impairments and blindness. *Assistive technologies for people with diverse abilities* (2014), 113–156.

[39] Mary M Murray and Mariana Mereoiu. 2016. Teacher–parent partnership: an authentic teacher education model to improve student outcomes. *Journal of Further and Higher Education* 40, 2 (2016), 276–292.

[40] US Department of Education. 2004. Individuals with Disabilities Education Improvement Act of 2004.

[41] Jessica Rizk and Cathlene Hillier. 2022. Digital technology and increasing engagement among students with disabilities: Interaction rituals and digital capital. *Computers and Education open* 3 (2022), 100099.

[42] Christian Ryan and Elizabeth Quinlan. 2018. Whoever shouts the loudest: Listening to parents of children with disabilities. *Journal of Applied Research in Intellectual Disabilities* 31 (2018), 203–214.

[43] Jaime Sánchez and Fernando Aguayo. 2008. AudioGene: Mobile learning genetics through audio by blind learners. In *IFIP World Computer Congress, TC 3*. Springer, 79–86.

[44] Jaime Sánchez, Marcia de Borba Campos, Matías Espinoza, and Lotfi B Merabet. 2014. Audio haptic videogaming for developing wayfinding skills in learners who are blind. In *Proceedings of the 19th international conference on Intelligent User Interfaces*. 199–208.

[45] Jaime Sánchez and Miguel Elías. 2008. Science learning in blind children through audio-based games. In *Engineering the user interface: From research to practice*. Springer, 1–16.

[46] Jaime Sánchez, Matias Espinoza, and J Garrido. 2012. Videogaming for wayfinding skills in children who are blind. In *Proc. 9th Intl Conf. on Disability, Virtual Reality and Assoc. Technologies, PM Sharkey, E Klinger (Eds)*. 131–140.

[47] Jaime Sánchez and Hector Flores. 2005. AudioMath: Blind children learning mathematics through audio. *International Journal on Disability and Human Development* 4, 4 (2005), 311–316.

[48] J Sánchez and H Flores. 2005. Training blind children to develop mathematics skills through audio. *CyberPsychology & Behavior* 8, 4 (2005), 354–355.

[49] Jaime Sánchez and Mauricio Sáenz. 2006. 3D sound interactive environments for blind children problem solving skills. *Behaviour & Information Technology* 25, 4 (2006), 367–378.

[50] Jaime Sánchez, Mauricio Saenz, and Jose Miguel Garrido. 2010. Usability of a multimodal video game to improve navigation skills for blind children. *ACM Transactions on Accessible Computing (TACCESS)* 3, 2 (2010), 1–29.

[51] Jaime Sánchez and Angelo Tadres. 2010. Audio and haptic based virtual environments for orientation and mobility in people who are blind. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. 237–238.

[52] Jaime Sánchez, Angelo Tadres, Alvaro Pascual-Leone, and Lotfi Merabet. 2009. Blind children navigation through gaming and associated brain plasticity. In *2009 virtual rehabilitation international conference*. IEEE, 29–36.

[53] Karen Y Sanders. 2006. Overprotection and lowered expectations of persons with disabilities: The unforeseen consequences. *Work* 27, 2 (2006), 181–188.

[54] Wendy Sapp and Phil Hatlen. 2010. The expanded core curriculum: Where we have been, where we are going, and how we can get there. *Journal of Visual Impairment & Blindness* 104, 6 (2010), 338–348.

[55] AI Seeing. 2020. App from Microsoft.

[56] Mazyar Seraj, Serge Autexier, and Jan Janssen. 2018. BEESM, a block-based educational programming tool for end users. In *Proceedings of the 10th Nordic Conference on Human-Computer Interaction*. 886–891.

[57] Dorothy G Singer, Roberta Michnick Golinkoff, and Kathy Hirsh-Pasek. 2006. *Play= Learning: How play motivates and enhances children's cognitive and social-emotional growth*. Oxford University Press.

[58] Kelli E Staples and Jennifer A Diliberto. 2010. Guidelines for successful parent involvement: Working with parents of students with disabilities. *Teaching exceptional children* 42, 6 (2010), 58–63.

[59] Rud Turnbull and Ann Turnbull. 2015. Looking backward and framing the future for parents' aspirations for their children with disabilities. *Remedial and Special Education* 36, 1 (2015), 52–57.

[60] Terese Wilhelmsen and Marit Sørensen. 2019. Physical education-related home–school collaboration: The experiences of parents of children with disabilities. *European Physical Education Review* 25, 3 (2019), 830–846.