"I want to think like an SLP": A Design Exploration of AI-Supported Home Practice in Speech Therapy

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ABSTRACT

Parents of children in speech therapy play a crucial role in delivering consistent, high-quality home practice, which is essential for helping children generalize new speech skills to everyday situations. However, this responsibility is often complicated by uncertainties in implementing therapy techniques and keeping children engaged. In this study, we explore how varying levels of AI oversight can provide informational, emotional, and practical support to parents during home speech therapy practice. Through semi-structured interviews with 20 parents, we identified key challenges they face and their ideas for AI assistance. Using these insights, we developed six design concepts, which were then evaluated by 20 Speech-Language Pathologists (SLPs) for their potential impact, usability, and alignment with therapy goals. Our findings contribute to the discourse on AI's role in supporting therapeutic practices, offering design considerations that address the needs and values of both families and professionals.

CCS CONCEPTS

• **Human-centered computing → Empirical studies; Artificial Intelligence**.

KEYWORDS

Speech and language difficulties, Artificial Intelligence, Human-centered AI

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1 INTRODUCTION

Speech and language difficulties encompass a wide range of conditions, such as difficulty in producing speech sounds correctly (e.g., substituting one sound for another, like "wed" for "red"), challenges in expressing or comprehending language, difficulties in social and cognitive communication, and feeding and swallowing issues [10]. Although these challenges can affect both adults and children, they are more prevalent in children. An estimated 16% to 21% of 5-year-olds experience speech and language difficulties [11, 90], which can place them at a higher risk of lower academic achievement [14], poorer mental health and higher rates of unemployment [18, 61]. Prior research has shown that consistent and high-frequency speech practice is key to successful outcomes in speech therapy [5, 105]. As a result, interventions with speech-language pathologists (SLPs) are often supplemented with home practice, where primary caregivers–typically parents, guardians, grandparents, or other relatives–are responsible for carrying out therapeutic exercises to reinforce and extend a child's skills [8, 104, 105, 113]. In our study, all primary caregivers were parents, and thus, we will use the term "parents" to

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describe the participants throughout. Additionally, home practice also promotes carryover[1] which is defined as "*the ability for an individual to take a skill learned in therapy and apply it to different situations and contexts*" [72].

Despite its importance for therapeutic success, parents often struggle to incorporate speech activities into everyday home settings [40, 105, 116], facing challenges such as meaningfully engaging their child during home practice and accurately applying therapeutic strategies without consistent guidance from SLPs [3, 46, 47, 83]. Prior research has shown that parents often feel overwhelmed by these demands, and the pressures of managing busy family schedules and other commitments can further limit the time available for home practice [40, 104, 111, 116]. Emerging technologies, such as Artificial Intelligence (AI), offer new possibilities for supporting parents in this role [22]. Research has demonstrated AI's potential to provide adaptive, personalized support in contexts like education [13, 27, 50, 68] and healthcare [33, 112]. While existing research has explored direct AI interactions with individuals undergoing therapy [16, 23, 89], exploring how AI might support parents in implementing therapeutic practices remains underexplored. This focus is critical, as parents play a central role in home practice but face distinct emotional, informational, and logistical challenges. This leads us to ask: *How might AI technologies be imagined and designed to support parents in conducting home practice of speech and language skills?*

To explore this question, we conducted a multi-phase study. In phase 1, we held semi-structured interviews with 20 parents to understand their experiences with home practice and to gather their ideas on how AI could support them. Phase 2 involved translating parent generated ideas into actionable AI design concepts, which we represented through storyboards. Storyboards were chosen because they offer a visually intuitive way for participants to engage with diverse AI concepts without requiring prior technical knowledge [73, 114]. Finally, in phase 3, we surveyed 20 SLPs to evaluate these design concepts, gathering their feedback on the potential opportunities and challenges for AI-supported home practice. Our findings underscore the key challenges parents face in conducting home practice, including balancing multiple therapeutic demands, navigating discrepancies between home and therapy environments, sustaining child engagement, and coping with isolation. In response to these challenges, both parents and SLPs see AI as a promising solution, albeit with some concerns. Parents envision AI as a multifaceted tool that can provide informational, practical, and emotional support while remaining adaptable to varying levels of oversight. Similarly, SLPs recognize AI's potential to bolster parent confidence by reducing errors, offering structured guidance, and fostering collaboration across therapeutic settings. However, SLPs also raise concerns about possible drawbacks, including increased screen time, frustration from overuse, privacy issues, and the risk of adding to parental workload.

In examining the needs, opportunities, and challenges that parents experience around AI-supported carryover practices, we find that automation alone may not fully address the complexities of integrating AI into home-based therapy. Our contributions inform the design of AI tools that balance technological advancements with the emotional and relational aspects of parent-child interactions, ensuring that these tools enhance rather than disrupt the therapeutic process. In the remainder of this paper, we provide background on home practice and review related work. We then outline the study's methodological approach, including the development of storyboards, data collection procedures and analysis. Finally, we present our results and discuss their implications for designing AI-supported tools that align with parent and SLP values, ensuring effective and family-centered home practice.

[1]The terms "home practice" and "carryover" are used synonymously by different stakeholders [72, 105]. This paper uses these terms interchangeably based on context.

2 BACKGROUND AND RELATED WORK

We begin by providing background on the challenges parents face in implementing speech practice at home. We then review and situate our research in relation to prior work on technologies for delivering speech therapy to children and technologies that support parents in optimizing health and learning outcomes.

2.1 Complexities in Managing Home Practice Activities

Home practice serves both therapeutic and relational goals by improving children's skills through consistent practice, strengthening the parent-child bond, and fostering parent-SLP partnerships [104, 116]. For SLPs who have limited opportunities for direct parent interaction, sending activities home is the most common strategy to extend therapy and maintain parental involvement [104, 110, 113]. Depending on the goals of the intervention, home practice activities may require parents to replicate structured therapy exercises at home, reinforce skills learned during therapy into their child's daily routines, or combine both approaches [103]. Thus, these activities vary in format and may involve the child producing target sounds in engaging contexts, such as games (e.g., a memory card game where the child says words as they turn over cards), or completing structured exercises like worksheets requiring a pre-determined number of repetitions [103, 104]. Alternatively, parents might be encouraged to create simple activities that can be completed alongside other tasks, such as during meals, car rides, or bath time to ensure completion and reduce the burden on families [105, 109].

Typically, home practice is recommended to be carried out five to seven times a week, with each session lasting between five to fifteen minutes [104]. However, many parents report difficulty fitting home practice into their daily routines and often forget to complete it [40, 105]. For example, Goodhue et al. [40] found that parents frequently cited lack of time, fatigue, and the unpredictability of family schedules as significant barriers to completing practice sessions as recommended. Similarly, Sugden et al. [105] highlighted that even with strong intentions to adhere to home practice routines, the demands of juggling work, childcare, and household tasks often led to missed or incomplete sessions. These challenges were further exacerbated by the need to adapt speech practice to engaging activities and make therapy enjoyable, which many parents found difficult without the direct support of SLPs [104]. Additionally, parents often struggle to recall specific details of activities demonstrated by their SLPs, particularly when several days pass between scheduled sessions and home practice [105]. They also express uncertainty about how to handle situations when their child makes errors, such as

mispronouncing a target word or sound. Adding to these challenges is the shortage of SLPs [31, 74, 77], which significantly limits parents' opportunities to connect with professionals for guidance and feedback. Tambyraja et al. [109] found that while SLPs frequently assign home practice activities, the rate of follow-up to ensure completion or address challenges is considerably lower than the rate of assigning these tasks. Consequently, parents often experience feelings of guilt for not completing assigned home practice, anxiety about their child's progress, and the stress of balancing therapy requirements with other responsibilities. [40, 49, 105, 111]. Given these interconnected challenges, it is crucial to design solutions that better support parents in managing home practice activities, ensuring they are equipped with the necessary informational, practical, and emotional support to effectively engage in their child's speech therapy.

2.2 Technologies to Support Speech Therapy Delivery for Children

The challenges parents face in managing home practice activities (outlined in Section 2.1) highlight the need for tools that can support two distinct but complementary types of home practice activities: 1) replicate structured therapy exercises at home and 2) reinforce skills learned during therapy in accessible, everyday contexts. Prior work on technologies designed to replicate structured speech therapy exercises often emphasize tasks that combine practicing target sounds or words with real-time feedback mechanisms to monitor progress and improve speech accuracy and fluency [23]. Early systems like the Indiana Speech Training Aid (ISTRA) laid the foundation by providing patient-specific feedback and graphical representations of utterance scores during computerized drill sessions [55, 115]. This set the stage for subsequent advancements like the Articulation Tutor (ARTUR), which further refined real-time speech analysis and feedback mechanisms to improve children's articulation [32]. Building on these early systems, researchers have increasingly leveraged AI and machine learning to provide real-time feedback in speech therapy [16, 89, 92, 93, 95]. For example, Bilkova et al. [12] used convolutional neural networks and augmented reality to capture detailed articulation patterns. A key element in these systems is the use of feedback mechanisms, which are critical for effective pronunciation practice. Darejeh et al. [23] emphasized the value of such mechanisms in their review, particularly highlighting the effectiveness of visual displays of articulation (e.g., 2D or 3D face views of tongue, lip, and jaw movements) in improving learning outcomes. These visual aids are especially beneficial for children, as they provide a concrete, relatable way to understand abstract speech concepts, even in the absence of detailed verbal explanations [23].

Prior research has also explored tools that reinforce skills learned during therapy in accessible, everyday contexts. For example, Open Sesame? Open Salami! (OSOS) leverages generative AI and pervasive profiling to identify vocabulary that reflects each child's unique linguistic needs and integrates these words into engaging, narrative-driven interventions [63]. Additionally, generative AI systems have been explored for their ability to generate therapy materials, simulate human-like communication, and reduce preparation time for material generation [29, 106]. Beyond embedding therapy into daily routines, prior research also emphasizes the importance of designing tools that evoke excitement and foster sustained participation [25]. Digital games have been found to be a promising approach, as they combine therapeutic activities with elements of play which can increase motivation, adherence, and learning outcomes [19, 23, 30, 41, 42, 51, 52]. For example, Talking to Teo is a story-driven game where players complete utterance repetitions to advance the narrative [80]. Similarly, commercial applications like Apraxia Farm [99], Articulation Station [66], ArtikPix [34], and Tiga Talk [107] demonstrate how integrating therapy with gameplay can improve engagement and outcomes for children.

2.3 Technologies to Support Parents in Optimizing Health and Learning Outcomes

While advancement in technologies that facilitate real-time feedback, progress monitoring, and child engagement (as discussed in Section 2.2) have supported the delivery of speech therapy, enabling parents to maintain an active and relational role during home practice remains under-explored. Within HCI literature, there has been some exploration of coaching parents through approaches like Video Interaction Guidance (VIG), where video recordings are used to train parents in supporting their child's language development at home. For example, Abdullah et al. [3] examined a video-based platform designed to assist mothers of preschool children with cerebral palsy in delivering home practice.

Beyond speech therapy, research on caregiving tools for children with disabilities and chronic health conditions highlights the dual importance of providing both practical and emotional support to caregivers [56, 67, 70, 71]. Such tools demonstrate that when parents are well-equipped to manage caregiving responsibilities, they can more effectively participate in their child's developmental and therapeutic activities. For example, prior work has explored care coordination tools that manage interactions with healthcare providers, therapists, and educators [82, 86, 91]. These tools have proven instrumental in reducing parents' cognitive load by helping them manage the complex demands of caregiving. Furthermore, task management systems that organize daily routines [43, 81] and communication platforms that improve collaboration between parents and professionals [6] have been critical in supporting parents of children with chronic health problems. Prior work has also highlighted the value of digital health interventions in providing emotional support through mobile apps and online platforms [28, 56, 60, 85–87], as well as the role of peer support networks in connecting parents with others facing similar challenges [20, 57]. Interactive technologies like biofeedback systems have also been explored for stress management [96, 100], emphasizing the need for support systems that cater to both the practical and emotional needs of caregivers. Building on these developments, our work examines varying levels of AI oversight and explores how AI can provide informational, logistical, and emotional support to address the challenges parents face during home practice.

3 METHODS

To gain a comprehensive understanding of how AI could support parents with home practice, we conducted a multi-phase study that incorporated perspectives from both parents and SLPs. Using mixed

Figure 1: Overview of the study design and timeline.

methods—including interviews, storyboards, and surveys—we captured parents' lived experiences, developed AI design concepts grounded in their needs and ideas, and gathered feedback from SLPs to evaluate the desirability, and potential impact of these concepts. Each phase provided unique insights, highlighting important considerations for integrating AI into home practice. Figure 1 provides an overview of the study design and timeline. Our study was reviewed by our university's Institutional Review Board (IRB) and classified as exempt.

3.1 Phase 1: Semi-Structured Interview with Parents

We first conducted semi-structured online interviews with parents to understand their current experiences with conducting home practice activities and to explore their ideas on AI-supported carryover. The online format allowed parents to participate from their own homes, while ensuring a broader reach across diverse geographic locations.

3.1.1 Participants. We distributed a brief study description and an initial screening survey via email through a university participant pool and expanded recruitment using snowball sampling. We determined eligibility using the following inclusion criteria: 1) currently engaging in home practice with at least one child under 15 years old, and 2) the ability to participate in a Zoom interview. Table 1 provides information of the 20 parent participants whose children were working on various speech therapy goals, including improving articulation, fluency, expressive and receptive language and social communication. The children's ages ranged from 0-3 years to 11-14 years. Most parents (15/20) spoke only English at home, while others spoke additional languages, including Arabic, Swahili, Ukrainian, and Russian. Parents reported varying frequencies of home practice, with some engaging several times per week (7/20), others practicing daily (3/20), and a few reporting less frequent practice, such as once a week (2/20).

3.1.2 Procedure. Each interview lasted approximately 1 hour, during which we asked parents about the types of home practice activities they regularly engage in with their child, how they communicate and collaborate with their child's SLP, and both the positive and negative experiences they have while conducting home practice (see Appendix A for interview protocol). For each challenge they encountered, we asked parents to brainstorm ideas for AI-supported solutions, drawing on their own experiences. This approach allowed parents to focus on their needs and imagine potential support, regardless of their familiarity with AI. The semi-structured format further supported this process by providing flexibility to adapt discussions to each participant's unique context. While all participants were asked the same questions, interviewers could probe deeper or clarify ideas as needed, enabling participants explore a range of possibilities for AI-supported solutions.

Additionally, our decision to rely on parents' existing familiarity with AI was informed by pilot testing conducted with two parents (not included in the final study sample), where we showcased different examples of AI capabilities, such as speech-to-text transcription and text-to-image generation at the beginning of the interview. While these examples were meant to illustrate AI's possibilities, they inadvertently caused participants to feel intimidated and limited their ability to generate contextually relevant ideas. Participants also anchored their suggestions to the examples provided, which risked biasing the brainstorming process. By removing these examples in the final interviews, we aimed to ensure that parents' design ideas were grounded in their lived experiences and unconstrained by external framing. Participants received a $35 Amazon gift card for their participation.

3.1.3 Data Analysis. We audio recorded all interviews and transcribed them for analysis, using Rev, [2] a secure audio transcription service. We analyzed the parent interview data using thematic analysis [17]. The coding team—comprising the first, second, and third authors—began by independently open coding two randomly selected transcripts. This initial round of coding generated a broad range of preliminary codes, such as "parental involvement" and "AI-supported home practice." The team then collaboratively reviewed these codes, examining example quotes, considering counter-examples, and merging overlapping codes. For example, the codes "frustration with technology" and "technology-related stress" were consolidated into a single category, "technological challenges." These collaborative discussions resulted in a preliminary codebook. Next, the coding team independently applied the

[2] https://www.rev.com/

Table 1: Reported Parent Participant Details

ID	Relation to Child	Race	Home Languages	Child Age (Yrs)	Speech Therapy Goals	Home Practice Frequency	Membercheck Survey
P1	Mother	White	English	0-3	Expressive & written language, Articulation, Fluency	Daily	Yes
P2	Mother	White	English	7-10	Social communication, Fluency, Articulation	Multiple times/day	Yes
P3	Mother	White	English	11-14	Articulation, Cognitive rehabilitation	A few times/month	Yes
P4	Father	White	English	7-10	Expressive language	Several times/week	Yes
P5	Mother	White	English	7-10	Expressive & receptive language, Articulation	Several times/week	Yes
P6	Mother	White	English, Russian	4-6	Expressive & written language, Articulation, Fluency	Daily	Yes
P7	Mother	White	English	4-6	Reading & comprehension, Sentence usage	N/A	No
P8	Mother	White	English	7-10	Articulation, Expressive & pragmatic language	Daily	No
P9	Mother	Black	English, Arabic, Swahili	7-10	Expressive language, Articulation	Several times/week	Yes
P10	Mother	White	English	11-14	Articulation	A few times/month	Yes
P11	Mother	White	English	4-6	Expressive language	Several times/week	Yes
P12	Mother	White	Ukrainian	0-3	Expressive language	Once/week	Yes
P13	Mother	Black	English	4-6	Expressive & receptive language	Once/week	Yes
P14	Mother	White	N/A	7-10	N/A	N/A	No
P15	Mother	White	English	4-6	Expressive language, Articulation	Several times/week	No
P16	Mother	Multiracial	English	7-10	Expressive & written language, Articulation, Fluency	Several times/week	No
P17	Mother	White	N/A	11-14	N/A	N/A	No
P18	Mother	N/A	English	11-14	Articulation, Fluency, Vocabulary	Several times/week	Yes
P19	Mother	White	English	0-3	Articulation, Fluency, Vocabulary	N/A	Yes
P20	Mother	Multiracial	English	7-10	N/A	N/A	No

codebook to two additional transcripts and refined it further during subsequent discussions. This process was repeated iteratively: the revised codebook was applied to two new transcripts in each round, with the resulting discussions guiding further refinements, until the final version of the codebook was agreed upon by the coding team. The final codebook included four main code categories: 1) Home Practice, 2) Home Practice Challenges, 3) Design Ideas, and 4) Parent Values, each with associated subcodes (see Table 6 in Appendix B). With the final codebook established, the coding team systematically applied it to the entire dataset. We then organized the codes into overarching themes through several iterative rounds of refinement and discussion. Once the themes were finalized, the first author revisited the entire dataset to extract representative quotes for each theme.

3.2 Phase 2: Development of Storyboards and Design Concepts

Building on the insights from parent interviews, we aimed to translate the diverse set of ideas generated by parents into actionable and technically feasible AI design concepts. To ensure these concepts were grounded in the lived experiences of parents, we first developed four-panel storyboards that illustrated the key challenges parents face during home practice. Figure 2 shows an illustrated example of a storyboard detailing a home practice scenario.

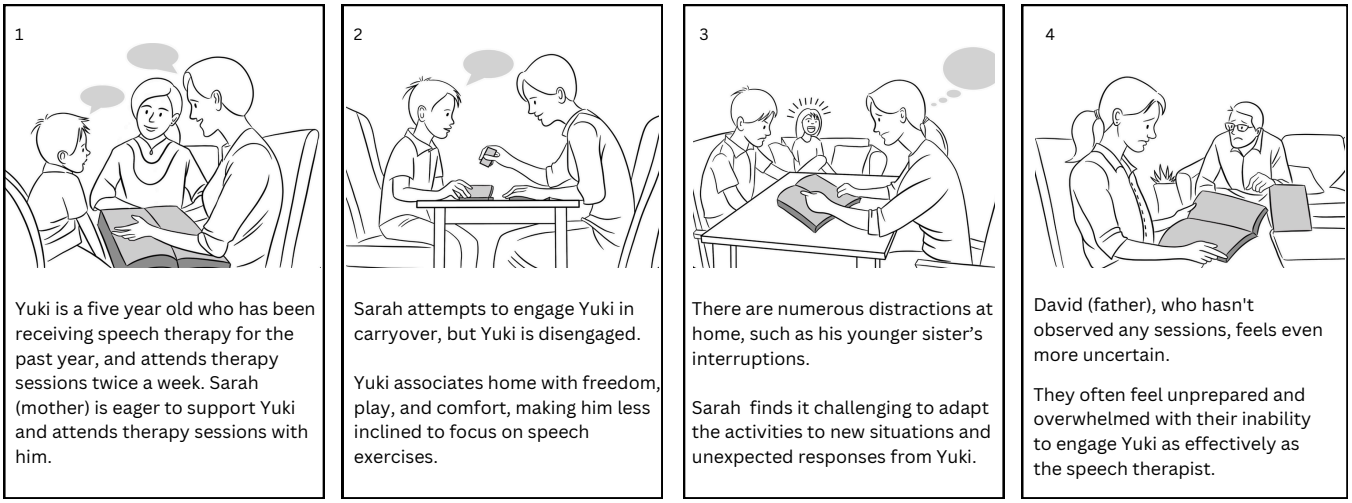

Figure 2: Storyboard depicting challenges parents encounter during home practice.

Table 2: AI Design Concepts for Supporting Home Practice

AI Design Concept	Description
Practice Planner	Incorporates recommender systems to identify and suggest suitable practice times while addressing scheduling conflicts through integration with the family's calendar. Additionally, it leverages large language models (LLMs) to generate home practice ideas tailored to the family's daily routines and the child's individual interests.
Speech Companion	Uses automatic speech recognition (ASR) and adaptive feedback to engage children in natural dialogue [88, 119]. It tracks word usage and pronunciation accuracy to identify areas for improvement. Targeted exercises are incorporated during conversations, ensuring practice feels engaging and contextually relevant.
Articulation Visualizer	Uses advanced text-to-video generative models to visually demonstrate correct mouth and tongue positions for producing speech sounds [23, 94]. Empowers parents to confidently teach articulation techniques at home.
Pronunciation Guide	Uses ASR to deliver real-time feedback during practice sessions, listening to both the child and parent as they read aloud specific phrases [12]. It evaluates pronunciation accuracy and provides clear, actionable corrections when needed [95].
Therapy Organizer	Consolidates assignments from multiple therapy providers using task optimization algorithms to help parents manage therapy tasks for their children. Therapists can review, approve or modify the integrated activity plan to ensure it aligns with therapy goals across all disciplines.
Progress Tracker	Tracks and synthesizes progress data from various therapies that complement speech therapy (e.g., occupational therapy, physical therapy), providing cohesive insights in clear, easy-to-understand formats. It then generates a structured practice plan [92, 93] with recommended time allocations for each therapy to ensure a balanced, integrated approach.

Prior research highlights the value of storyboards in helping researchers empathize with stakeholders (in this case, parents), foster a deeper understanding of their experiences, and provide relatable use cases to guide design decisions [73, 114]. Additionally, creating storyboards alongside thematic analysis prompted deeper reflection on the data, uncovering nuances and interconnections between themes. This process ensured that both the analysis and the resulting design concepts remained closely aligned with parents' experiences.

Following this, the research team, comprising of AI and HCI researchers, conducted a design synthesis process [59] to translate the ideas gathered from parents into structured design concepts. This process involved analyzing the relationships between the ideas provided by different parents, identifying complementary aspects,

and unifying them under cohesive design concepts that addressed key challenges in home practice. For example, a design idea involving adaptive practice schedules was linked to another idea about tracking daily progress, resulting in the broader design concept "Progress Tracker" (see Table 2). After multiple discussion sessions, we developed six AI design concepts to support home practice, which are also summarized in Table 2.

To provide a visually intuitive way to engage participants with the AI design concepts, we created multi-panel storyboards. We chose storyboards because prior research highlights that they are well suited for eliciting meaningful feedback from participants who may lack familiarity with AI systems [15, 69, 97, 122]. Their minimal technical detail allows participants to focus on conceptual ideas without without being distracted by the technical details [73, 114]. Figure 3 shows an illustrated example of a storyboard detailing the design concept "Practice Planner" through captions. We depicted the storyboard characters and settings using a clean, line-drawing aesthetic with minimal details. This style encourages participants to imagine themselves in the depicted situations and facilitates nuanced evaluation of emerging technologies that reflects their lived experiences, while avoiding visual elements that might introduce bias [114, 122].

3.2.1 Member Check and Storyboard Refinement. To ensure the design concepts reflected parents' ideas and aligned with their expectations, the AI design storyboards were distributed as part of an online survey to the 20 parents we had initially interviewed, with 13 parents participating (see Table 1). In the survey design, we adapted McKim's meaningful member-checking approach [75], which emphasizes the role of participant feedback in verifying research accuracy. We asked parents to rate how accurately each design concept captured their design ideas on a scale from 1 to 5, where 5 indicated the highest level of accuracy. The overall average rating across all design concepts was 4.58 (SD = 0.67), indicating that the design concepts were generally perceived as closely aligned with parents' ideas. We also asked parents to provide open-ended responses to highlight elements that resonated with their experiences and suggest improvements. This feedback guided targeted adjustments, ensuring the AI design storyboards reflected parents' priorities and perspectives.

3.3 Phase 3: Survey with SLPs

Building on the development of AI design storyboards in phase 2, we used an online survey to gather feedback from 20 SLPs on the potential impact of these concepts. The survey format accommodated the demanding schedules of SLPs, enabling a larger group of participants to engage with the design concepts. This decision was informed by our prior engagement with SLPs, which revealed their preference for surveys over interviews due to time constraints. Moreover, the asynchronous visual format of the survey enabled participants to engage in independent reflection, potentially alleviating any perceived pressure to express approval of the design concepts.

3.3.1 Participants. We disseminated a brief description of the study to the participation pool previously compiled by our research team.

Table 3: Reported SLP Participant Demographics

Social Category	Participant Demographics (n=20)
Gender	95% Woman, 5% Man
Race	95% White, 5% prefer not to respond
Age Range	35% 25-34 years old, 25% 35-44 years old, 40% 45-54 years old
Years of Experience	20% 1-5 years, 20% 6-10 years, 45% 11-20 years, 15% 20+ years
Age of Clients*	30% 0-3 years old, 60% 3-5 years old, 75% K-5, 20% middle School, 20% high school
Community Setting	30% urban, 50% suburban, 20% rural
Work Setting*	70% public school, 25% private practice, 15% early intervention, 15% hospital, 5% teletherapy
AI Experience	50% Used AI, 50% Did not use AI
AI Perception*	70% See promise in AI, 25% Concerned about AI's impact, 25% Unsure about AI

**some participants were counted twice based on their answers*

This pool was created using various outreach methods, including professional channels such as the American Speech-Language-Hearing Association (ASHA) mailing list, the Division for Early Childhood (DEC) newsletter, and QR-coded business cards distributed at the November 2023 ASHA convention.[3] Table 3 provides descriptive statistics regarding the demographics of the SLP participants, presenting a diverse cross-section of professionals in the field. The majority of the participants in our study identify as women (95%) and White (95%), which is similar to the SLP demographics data reported by ASHA in 2022 (96.4% Female and 91.2% White) [9]. The age distribution showcases a spread, with the largest group falling within the 45-54 age range (40%). The study participants also have considerable professional experience, with 60% having over 10 years of experience in the field. Additionally, they represent diverse age groups and work in various settings, with 70% in public schools, 25% in private practice and 30% in other types of settings. 50% of the SLP participants have prior AI experience using AI tools. Additionally, 70% were optimistic about AI use in speech-language pathology, 25% expressed concern about its impact and another 25% were unsure of its role.

3.3.2 Instrument. To help participants evaluate the design concepts within the context of actual challenges faced by parents, we presented three home practice storyboards at the start of the survey. The first storyboard is shown in Figure 2, while the other two are included in Appendix C. Using the home practice scenarios as a framing tool, SLPs provided feedback on each design concept (e.g.,

[3]The ASHA convention is an annual gathering of professionals in speech-language pathology, audiology, and related fields, featuring presentations, workshops, and networking opportunities.

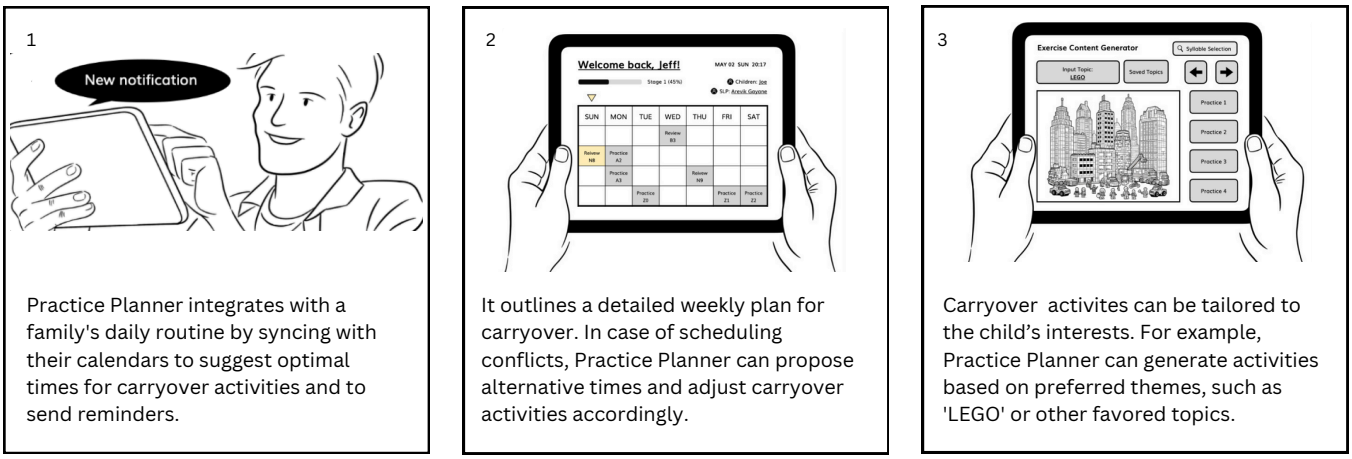

Figure 3: Storyboard illustrating the design concept Practice Planner.

Figure 3) by responding to three open-ended questions: (1) its potential benefits, (2) any concerns it raised, and (3) its effectiveness in addressing the needs of parents, children, and SLPs. Participants received a $25 Amazon gift card as a token of appreciation.

3.3.3 Data Analysis. We analyzed qualitative data from the open-ended questions using thematic analysis [17]. Similar to the data analysis of parent interviews, the coding team independently coded responses to identify recurring themes related to the potential benefits, concerns, and effectiveness of the AI design concepts. The coding process was iterative, involving multiple rounds of independent coding and subsequent discussions to refine themes. We resolved discrepancies in coding through discussion until we reached consensus.

4 RESULTS

We first present findings from our semi-structured interviews, which highlight: 1) the multifaceted challenges parents encounter when supporting their children during home practice and 2) their ideas for AI-supported solutions. Next, we discuss results from our survey of AI design concepts with SLPs, which provide insights into their perspectives on the potential opportunities and concerns of integrating these concepts into home practice. To ensure anonymity, parent participants are identified with a 'P' prefix and SLP participants with an 'S' prefix, then a unique ID (e.g., P12, S3).

4.1 Understanding Parents' Home Practice Challenges

4.1.1 Balancing Multiple Therapeutic Demands. Many parents noted that speech therapy was frequently paired with other therapies, such as occupational or physical therapy. This combination often resulted in overwhelming schedules and numerous daily tasks for parents. P1 shared their daily routine, highlighting the intensive nature of the care required, "*From the time she wakes up to the time she goes to bed, I'm working with her on something, whether it's her physical therapy exercises or her speech therapy exercises.*" P8 discussed the challenge of prioritizing these activities, which often involved making difficult decisions, sometimes progressing in one area at the expense of another, *"I had to get to the point where I would go in to the therapist and say I can do one because I'm also going to be doing physical therapy."* The challenge of coordinating different therapeutic approaches often fell on parents, who had to navigate the goals set by various providers. P8 expressed their frustration saying, *"Speech doesn't talk to education, doesn't talk to social... So as a parent, you have to decide what's most important."* Similarly, P7 parent highlighted the difficulty of coordinating saying, *"I have to interface between them, but I don't have the vocabulary or knowledge they use."*

4.1.2 Discrepancies between the Home and the Therapy Environment. Parents expressed challenges in replicating therapeutic techniques at home, where the controlled environment of therapy is replaced by the unpredictable nature of everyday life. P8 shared their frustration with this discrepancy, noting, "*When you're in speech therapy watching the therapist work with your child, it goes exactly according to plan. But at home, if he doesn't do it, I feel unsure. How long am I supposed to wait? Am I supposed to replace the word? Recreating anything that I see in the office is always really difficult because the details matter in speech.*" The unpredictability of children's responses further complicates the situation, as P13 expressed, "*You don't know how the child will react. A speech therapist would know, okay, if they don't do that, then I can try this. But at home, I'm at a loss.*" Parents also noted the difference in their child's engagement with therapists compared to at home. As P12 described, *"He will not participate at all. But when it's just a play... he would participate but not when I am trying to be, not mom but a teacher."*

4.1.3 Sustaining Child Engagement and Motivation. Nearly all parents reported significant challenges in keeping their children motivated for home practice activities. As P16 explained, *"By the time he gets done with school...his brain's just overloaded with everything else that he's done throughout the day."* Several caregivers noted that children often exhibit signs of fatigue and frustration, requiring adaptive strategies from the parents. P6 elaborated, *"If it's a bad day, he's just sometimes maybe too tired to even put the work in...sometimes*

he'll just totally go to baby talk." Parents also expressed struggles with coming up with new ways to engage their children during therapy. P9 emphasized, *"How am I supposed to come up with activities that are engaging and won't bore her every other week? Imagine that, that's a whole task."* Similarly, P10 shared, *"Both of them are autistic. So at the end of the day, I've been at this for many years. How do I provide support that looked and continues to look different every single year of their lives?"*

4.1.4 Coping with Isolation and Lack of Social Support. Parents often experience significant isolation and emotional strain and the impact on their ability to conduct home practice. P1 described the emotional toll of being the sole caregiver due to their partner's work commitments, "*Unless her respite provider is here or the therapists are here, I'm the only one doing it because her dad isn't home very much. He works a lot... Yeah, we cry together a lot.*" Parents frequently noted the isolation stemming from their unique caregiving responsibilities. As P10 explained, "*We do live a life of isolation because we're not the ones taking our children to the same places that other neurotypical kids are going. Those places aren't sensory friendly, or you're too worried about a major meltdown… It's isolating. A lot of people don't see us because we keep to ourselves, and it's the burden you bear… Most days it's okay. Some days it really sucks.*" P3 highlighted the internal anxiety and solitude resulting from a lack of understanding and support from others, "*I think I ended up having a lot of internal anxiety for sure. I felt like I was in it alone just because my husband didn't understand...It kind of felt like I was managing everything myself. I don't think anyone in my life understood what was going on.*"

4.1.5 Parental Uncertainties around Modeling Correct Techniques. Parents often navigate the delicate balance of supporting their children's learning while managing their own uncertainties about the effectiveness of their techniques. P7, a non-native speaking parent shared their concern explaining, *"When I try to help my child with certain sounds, I worry that my own mistakes will carry on. If I'm not confident that I'm doing it right, how can I ensure my child is learning correctly?"* P10, who had speech difficulties as a child, reflected on their ongoing efforts to support their children, noting, *"I received speech therapy as a child due to hearing issues, and I still occasionally struggle with certain words. This makes it challenging to help my children with their homework because I don't want to model the wrong way to say things."* These concerns extend beyond just individual sounds or words. As P8 described, the fear of miscommunication can pervade all aspects of teaching, *"Unless it's explicitly pointed out, I might practice it incorrectly all week, and when I model it at home, it could be wrong."* Similarly P2 expressed their uncertainty with specific techniques, saying, "*I was very unsure of how to prompt. I was supposed to shove my hand up underneath his chin to give him the visual cue and I was like, Ugh.*"

4.2 Exploring Parent Ideas on AI-Supported Home Practice

The challenges parents face during home practice directly shaped their ideas for how AI could support them. Parents envisioned AI playing a range of roles, from directly participating in home practice by providing real-time feedback to taking on more passive functions, such as tracking progress. Through our thematic analysis, we identified two key categories for parents' design ideas: 1) the level of AI oversight (high or low; see Table 4) and 2) the type of support provided (informational, practical, or emotional; see Table 5). These categories allowed us to connect specific challenges to distinct combinations of oversight and support, offering deeper insights into parents' needs.

4.2.1 High Oversight, Informational Support. Parents frequently expressed difficulties replicating therapeutic techniques at home and discussed how AI, through high oversight and informational support, could help them model these techniques during home practice. For example, P11 envisioned AI as a coaching tool that could assist them in implementing strategies recommended by SLPs: *"It could evaluate how we're doing and guide us. The human therapist provides the expertise, but could AI coach the parent on how they're implementing it?"* P13 echoed this sentiment, saying, *"The speech therapist has knowledge that I'm lacking, especially in new scenarios. An AI device would have that knowledge base to help with different situations and guide us on how to follow through."* Parents also imagined AI systems that could offer informational support by modeling articulation techniques, listening to speech practice attempts, and providing real-time feedback. P7 stated, *"AI could listen and identify where exactly we make mistakes."* Additionally, parents envisioned AI offering real-time visual demonstrations to complement verbal feedback, aiding them in teaching pronunciation techniques effectively. P16 described their idea, stating, *"If AI could show what my mouth should look like when making a sound, or where my tongue should go, that would be really useful."* Extending this idea further, P10 shared, *"AI could project a three-dimensional image of the face in front of you, so you could really see how the tongue and lips move. Seeing it in 3D, rather than on a flat screen, would make it easier to understand and replicate."*

4.2.2 Low Oversight, Practical Support. Balancing multiple therapies and managing overwhelming schedules were common challenges for parents. They explored how AI, offering low oversight, could help manage therapy schedules, streamline communication with providers, and track progress, thereby reducing the mental burden of managing multiple therapies. P16 proposed, *"[AI] could come up with combined activities, like you're about to go kick a ball for physical therapy, and it suggests five words you can practice from speech therapy while doing it."* Similarly, P11 emphasized the need for AI to provide clear, structured plans that require minimal input, *"I would respond well to AI saying, 'Do this for 15 minutes, Monday, Wednesday, Friday.' A specific plan."* Timely reminders were also seen as valuable, as P3 stated, *"Maybe even a reminder, like say usually we do homework after dinner and maybe you get a reminder at 6:00 PM like, oh, did you do the speech goal with your kid today?"* Additionally, parents saw AI as a tool for streamlining communication among providers, reducing the need for parental coordination, as P8 stated, *"If AI could identify and share the most important information with all the providers, it would save a lot of frustration."* Parents also wanted AI to centralize and manage therapeutic information, as P10 shared, *"If AI could track progress and show where my child is at a certain time, it would take that mental load off of me, especially with more than one kid in therapy."*

Table 4: AI Roles Categorized by Oversight Level

AI Oversight Level	Definition	Example
High Oversight	AI is actively involved during the session, providing continuous guidance and feedback. It takes proactive corrective actions.	*"AI could interact with him or to coach me through stuff."* (P18)
Low Oversight	AI provides preparatory or follow-up guidance, with minimal involvement during the session. It leaves corrective actions to humans.	*"AI would say these are the at-home things that you can do."* (P10)

Table 5: AI Roles Categorized by Support Type

Support Type	Definition	Example
Informational	AI helps parents carry out therapy activities and provides them with knowledge to effectively support their child's therapy.	*"AI could listen and identify where exactly we make mistakes."* (P7)
Emotional	AI offers support to manage stress, frustration, or emotional responses.	*"AI could suggest activities when my child gets bored."* (P5)
Practical	AI alleviates the logistical and organizational burdens that come with managing therapy, medical appointments, daily routines, and other caregiving duties.	*"AI could track progress and show where my child is."* (P10)

4.2.3 High Oversight, Emotional Support. The emotional challenge of home practice, which included managing both their child's frustration and their own, led parents to envision AI providing high oversight to ease the frustration and emotional stress. P12 expressed a desire for AI to offer real-time suggestions for de-escalation, saying, *"Sometimes when he's getting frustrated, I am getting frustrated too... AI may help me by giving some ideas to switch his attention to something else."* Additionally, parents envisioned real-time interactions with AI as a way to reduce emotional bias and offer a calmer, more measured perspective in stressful situations. For example, P8 stated, *"I bring my own emotional and personal baggage. AI is great because it's just looking at him, learning from him, very data-driven, and responding to him in ways that he might understand."* The same parent also gave the example of Alexa, noting that if such AI devices could understand and respond to their child, *"it would motivate so much speech."* Similarly, P18 expressed interest in an intelligent toy that could engage in real-time interactive play, saying, *"A toy that could model back-and-forth play, like, 'Okay, now it's your turn. Ooh, can I try?'"*

4.2.4 Low Oversight, Emotional Support. Parents often faced challenges in keeping their children engaged during home practice, particularly when dealing with fatigue or their child's shifting interests. They envisioned AI systems that, while still requiring parents to lead the practice, could alleviate the stress of planning activities by suggesting personalized content tailored to their child's evolving preferences. For example, P4 shared, "*My son, his wants and needs and likes change often...he likes dinosaurs and then in three months his desires change to, say, Legos so [AI] adjusts to your child's preferences and interests.*" Similarly, P6 added that AI could incorporate familiar characters to motivate and maintain their child's interest. "*As far as getting my kid motivated, if he felt like he was playing a game with his favorite cartoon character and that cartoon character wanted him to say the words ... then that could maybe be motivating for my kid.*" By providing adaptable and engaging content, low oversight AI could ease the burden of activity planning for parents, making home practice more manageable and less stressful.

4.3 SLP Perceived Opportunities of AI Design Concepts for Home Practice

To gather SLP perspectives on AI-supported home practice, we translated the diverse set of ideas generated by parents into actionable and technically feasible AI design concepts. These concepts were presented to SLPs through storyboards, where they identified several opportunities for AI to address challenges in home practice.

4.3.1 Boosting parent confidence. SLPs identified AI's potential to offer high oversight during home practice as an opportunity to boost parent confidence by helping parents avoid common mistakes. For example, S11 noted that that *Articulation Visualizer* (see Figure 4) *"would be great because for many children...parents forget the cues that were used or prompt the wrong articulator placement."* SLPs also highlighted the value of real-time feedback in removing the uncertainty around speech practice. S6 noted that *Pronunciation Guide* (see Figure 5) "*can be used with a variety of practice activities and provides immediate feedback on productions and offers corrections,*" while S9 added that real-time feedback could "*take the guesswork out of pronunciation feedback.*" Together, these comments show how real-time corrections can help parents offer more precise support without relying on guesswork. In addition to oversight, SLPs valued the informational support AI could offer, particularly in parental training. For example, S4 noted that *Articulation Visualizer "could improve [parents] own awareness of sound production in order to be able to provide more appropriate models and feedback for their child."* This reflects the broader benefit of AI not only in correcting errors but also in training parents to become more aware of speech techniques themselves, further boosting their confidence as active participants in their child's therapy.

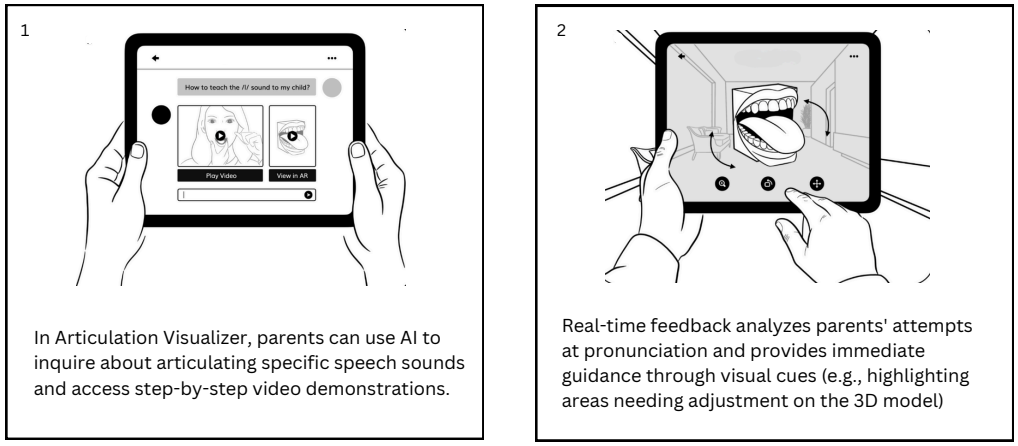

Figure 4: Storyboard illustrating the design concept Articulation Visualizer, as shown to SLP participants.

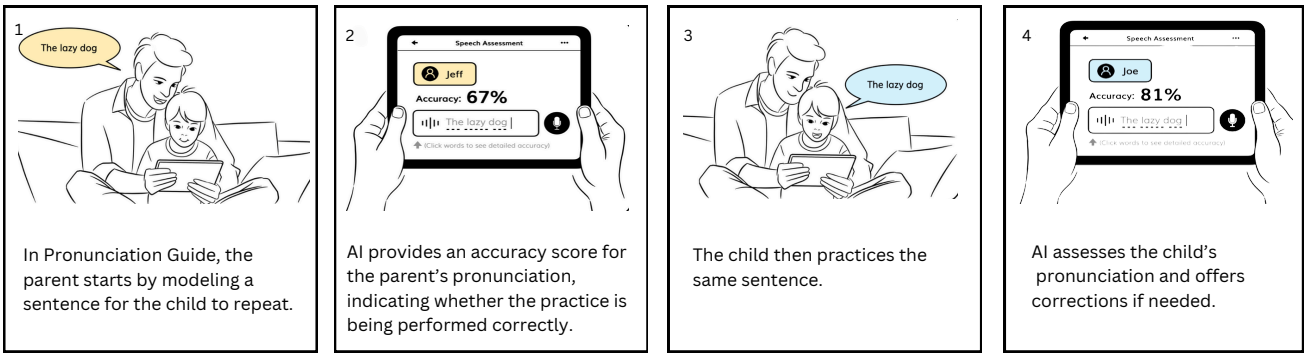

Figure 5: Storyboard illustrating the design concept Pronunciation Guide, as shown to SLP participants.

4.3.2 Time Saving. SLPs also recognized that low-oversight AI design concepts, such as *Therapy Organizer* (see Figure 6) had the potential to reduce repetition and alleviate parental overwhelm. For example, S7 noted *"Maximizing the use of single activities decreases the time and commitment required from caregivers and the child at home for carryover activities."* Similarly, S20 mentioned, *"it would alleviate so much stress and coordination for the parents and also streamline the child's goals so they would be more impactful."* Additionally, SLPs appreciated the time-saving aspects of AI, particularly in generating home practice materials. S10 remarked that *Practice Planner* (see Figure 3) *"would also save a lot of time in creating home practice materials. I think carryover activities would simply be completed a lot more often with a tool like this."* S4 echoed this sentiment, stating, *"The activities are pre-prepared, so the time a parent would have needed to devise practice contexts is saved,"* emphasizing the reduction in effort required by parents. Furthermore, S19 highlighted that the straightforward nature of AI-generated instructions was beneficial in *"reducing the 'thinking' time required for the activity."*

4.3.3 Integrating Cross Setting Collaboration. Effective collaboration across multiple therapeutic settings, such as home, school, and clinics, is essential for ensuring consistent progress for children receiving therapy. However, SLPs noted the difficulty of achieving this due to the fragmented nature of care across these settings. In response to these challenges, SLPs viewed low-oversight AI design concepts that foster collaboration across settings as vital for supporting a coordinated care approach. As S9 explained,

> "[Therapy Organizer] would be great across settings. Often in the schools collaboration is much desired by all, but there is very limited time to do it. Also collaboration with outside providers is desired but again - there's no system where there's direct access to seeing what others are doing so that treatment decisions and design can be more integrated. This information will therefore provide great input for the clinicians who are designing in-home intervention to make them more integrated for the child and family - which will also help with carryover."

Similarly, referring to *Therapy Organizer*, S6 underscored the importance of being cared for by a united team, stating, *"Professionals would be on the same page. The child would feel more accountable as they see professionals refer to each other's work."* Additionally, SLPs

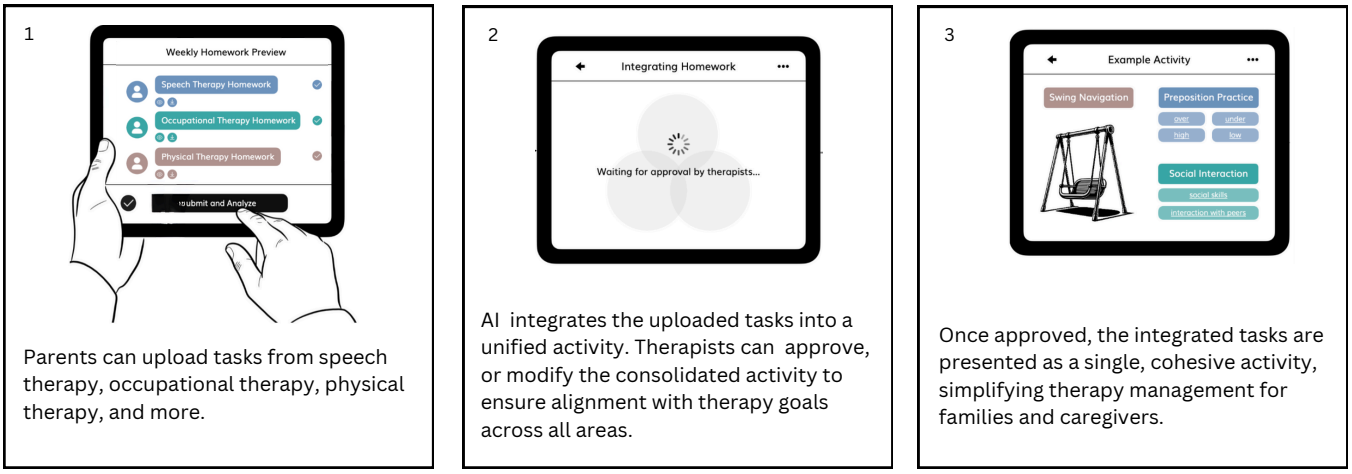

Figure 6: Storyboard illustrating the design concept Therapy Organizer, as shown to SLP participants.

also viewed centralizing information as a way for empowering caregivers. For example, S3 shared that *Progress Tracker* (see Figure 8) *"would make parents feel as though they had more control and understanding of their child's progress,"* potentially prompting more insightful *"questions as to why particular areas are not improving as quickly as others."*

4.3.4 Joint Collaboration and Engagement. SLPs viewed AI's oversight during home practice as a way to minimize potential conflicts between the parent and child, fostering joint collaboration and engagement. High oversight design concepts, such as *Pronunciation Guide* (see Figure 5), were particularly valued for its potential to externalize feedback, shifting the role of correction from the parent to the AI. For example, S5 noted that *Pronunciation Guide "allows for human bonding and interaction while externalizing feedback, thus preventing potential power struggles between parent serving as coach and child."* S7 echoed a similar sentiment sharing *Pronunciation Guide* would help, "*equalize kids with their parents."* SLPs also saw low oversight design concepts like *Practice Planner* (see Figure 3) as valuable for maintaining children's engagement by providing personalized and engaging materials. For example, S7 noted that, *"[Practice Planner could] help parents come up with diverse materials to keep their child engaged and excited about working on their carryover skills."* Similarly, S8 mentioned that by *"generating exercises based on the child's interests, parents don't feel like they are forcing homework that isn't applicable to the child and family."*

4.4 SLP Perceived Concerns of AI Design Concepts for Home Practice

Following the exploration of opportunities, this section examines SLPs' concerns regarding the AI design concepts. These concerns emphasize the need for careful consideration of the limitations and unintended consequences of AI in therapy, ensuring that its implementation aligns with both therapeutic goals and family well-being.

4.4.1 AI Contributing to Increased Screen Time. SLPs expressed concerns regarding the potential for AI tools to become just another form of screen time, which could detract from meaningful interaction between parents and children. Referring to *Speech Companion* (see Figure 7), S12 remarked, *"This is better than watching YouTube or other mindless shows, but we have to remember it is still a screen the child is playing with, and would likely be without a parent or adult nearby to do it with them."* S19 echoed this sentiment, highlighting broader developmental and health concerns, *"We are also trying to steer kids away from screentime given all of the problems research has shown with development and health."* Additionally, in reference to *Pronunciation Guide* (see Figure 5), S20 emphasized the importance of parental involvement, stating, *"I want to always make sure the parent is doing this WITH the child and not just giving this to the child to play with by themselves. That is always a concern of mine with AI, is that parents view it as screen time for the kids to enjoy by themselves but what we really need when learning speech and language is human connection."* SLPs emphasized that while AI can be useful in many areas, it cannot fully replace the nuances of human communication, particularly in building emotional connections. S6 explained in reference to *Speech Companion*, *"There is still a gap between knowing the right answer/knowing what to say and actually doing it in real time, and this robot couldn't use sarcasm/subtle cues/voice intonations."*

4.4.2 Risk of Frustration Due to AI Overreach. SLPs expressed concerns about the balance between using AI tools for therapeutic purposes and ensuring they do not intrude excessively into a child's personal time, which could lead to frustration or a decline in the child's enjoyment of their free time. A primary worry, particularly in reference to *Pronunciation Guide* (see Figure 5), was that parents might *"push children too hard, creating frustration. (S1)"* S3 noted, *"a child who repeatedly gets lower percent accuracy may get frustrated, which may decrease investment in treatment and issues for the family later on."* Additionally, S14 highlighted that AI might *"add pressure to interactions that can already be strained by the desire of a parent to help their child."* S14 also warned that *"without an SLP to monitor and*

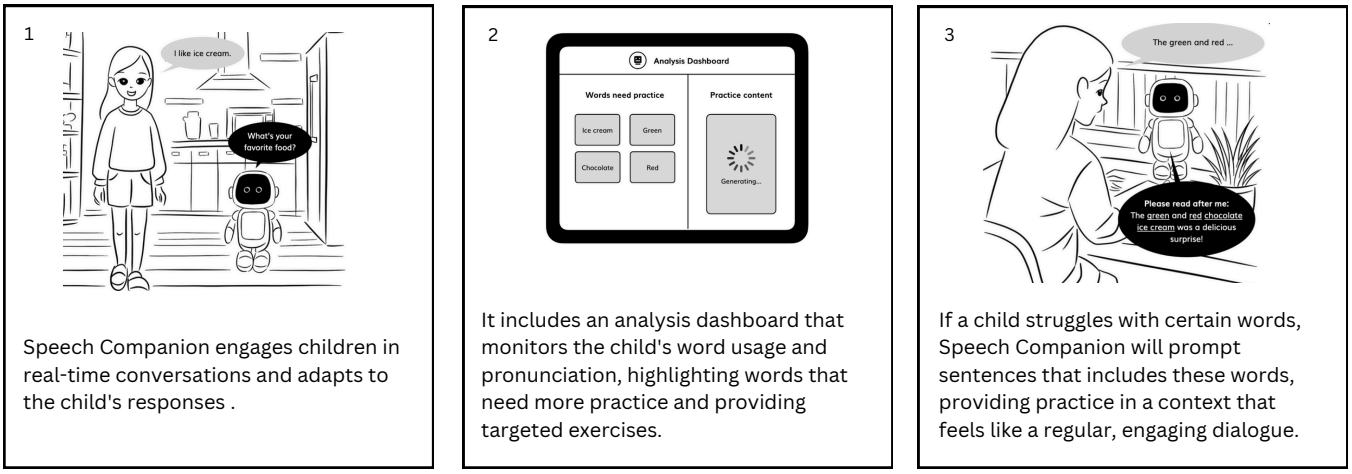

Figure 7: Storyboard illustrating the design concept Speech Companion, as shown to SLP participants.

adjust, families might become frustrated/anxious." Participants also expressed concerns about the potential for AI tools to overreach into a child's personal life, particularly when these tools begin to encroach on free time at home. S6 emphasized the importance of preserving the home environment saying, *"The fact that home is a 'free and safe' place from extra pressure or external requests might come into play, meaning the child might respond positively for the first week or two but then start to feel that their favorite playtime activities are being interrupted or encroached upon."*

4.4.3 Increase in Parental Workload. SLPs raised concerns that while the design concepts reduce certain burdens through AI, they may inadvertently shift additional workloads onto parents, potentially negating the intended benefits. For example, in reference to *Progress Tracker* (see Figure 8), SLPs expressed concern that the tools might demand detailed and accurate therapy progress notes from parents. S8 cautioned that this requirement *"may not always take into account prompting levels, etc."* and could *"put more work on parents to manage all the progress notes."* Similarly, the responsibility of maintaining and managing AI-supported tools was seen as a potential source of increased workload. S7 remarked, *Speech Companion* (see Figure 7) *"requires that the caregiver takes care of the device and keeps it in good working order at all times,"* adding to the list of tasks parents need to manage. SLPs also highlighted the additional time commitment *Practice Planner* (see Figure 3) might require, with S1 stating, *"Carving out these extra times is not only difficult due to schedules, but it's putting pressure on parents."*

4.4.4 Data Constraints and Privacy Concerns. SLPs expressed concerns about potential challenges related to data rigidity and privacy when using AI systems in home practice activities. S10, working in a large hospital network, highlighted institutional challenges in using *Therapy Organizer* (see Figure 6) saying, *"We face challenges with not being able to recommend certain pieces of technology because they are not HIPAA compliant, so I think this could be a problem for the administrative staff and SLPs making the recommendations."* While modern AI systems can be designed to adhere to privacy regulations, privacy concerns remained a recurring theme. Participants were particularly apprehensive about the potential for broad access to sensitive information. As S2 noted, *"I do wonder about privacy since it will have to be accessed by multiple providers,"* reflecting worries about data sharing across different professionals and settings in *Therapy Organizer*. S8 raised concerns about the perception of privacy invasion in *Pronunciation Guide* (see Figure 5), stating, *"Others might see it as an invasion of privacy since it is monitoring speech."*

5 DISCUSSION

Parents play a critical role in facilitating speech therapy at home, yet they often face challenges in implementing home practice [104, 105, 110, 116]. Our study explores these challenges through the lens of parental experiences and identifies opportunities for AI-driven support. During home practice, parents reported engaging in both routines-based and structured activities [103]. Routines-based activities, while simpler to integrate into daily life, often required creative adaptations to to fit their child's interests and behaviors [105, 109]. Many parents found this adaptation challenging, citing their child's shifting interests, moments of frustration, and the difficulty of sustaining engagement withing the unpredictable nature of everyday life [40, 104, 105]. Conversely, structured activities involved pre-designed tasks requiring focused time and attention. While these activities offered clarity in terms of therapeutic goals, parents often struggled to replicate therapeutic techniques [40, 105, 116]. Balancing speech therapy with additional therapies, such as occupational and physical therapy increased the demands on parents' time and energy. This cumulative responsibility often disrupted the consistency of home practice, as parents struggled to allocate adequate time to each therapeutic activity. Furthermore, the dual role of caregiver and implementing home practice placed emotional strain on parents, manifesting as stress, burnout, and feelings of isolation. These challenges align with broader caregiving literature, which highlights similar experiences among parents of

Figure 8: Storyboard illustrating the design concept Progress Tracker, as shown to SLP participants.

children with developmental disabilities and chronic health conditions [56, 65, 85, 98, 102].

In envisioning AI designs to support home practice, parents drew on their challenges to imagine AI as a valuable ally. They shared ideas for systems that could provide real-time feedback during therapy sessions [16, 23, 92, 93, 95], guide activities [13, 89], manage frustration, and centralize logistics [6, 43, 81] across multiple therapies. Furthermore, parents expressed a desire for AI systems that could adapt dynamically to their child's progress and preferences [63], providing tailored strategies that evolved over time. This adaptability is crucial, as rigid systems can alienate parents who are already navigating the unpredictable nature of their child's engagement and responsiveness. Additionally, the dynamic nature of therapy highlights the importance of AI systems that can adapt to a child's development of new skills or the emergence of new challenges, ensuring continued effectiveness and relevance. However, SLPs expressed a mixed perspective on these capabilities, identifying AI's potential while raising concerns about over-reliance, privacy, and shifts in parent-child dynamics. For example, SLPs appreciated the value of real-time feedback to boost parents' confidence and provide clear, immediate guidance. However, they cautioned that overly frequent or critical feedback could lead to frustration for both parents and children [76]. Similarly, while AI's ability to centralize therapy tasks across multiple settings was praised for its efficiency, concerns were raised about privacy risks and the administrative burden this could impose on already overwhelmed parents. Additionally, AI-generated personalized practice materials were seen as engaging, but SLPs warned about increased screen time detracting from meaningful, interactive aspects of therapy, which are crucial for fostering parent-child connection and engagement [45]. In the next section, we present design implications for AI-supported home practice, grounded in these insights.

5.1 Design Implications for AI-Supported Home Practice

5.1.1 Balancing AI Oversight with Autonomy. High AI oversight during home practice can provide structured guidance and real-time feedback, making it easier for parents to replicate therapeutic techniques. However, excessive AI oversight could undermine intrinsic motivation [24], particularly if the AI's feedback is perceived as overly critical or intrusive. A phased approach to AI oversight can address this tension where AI's involvement decreases as parents' skills and confidence grow, ultimately enabling them to manage therapy independently without needing AI guidance. Adaptive AI systems can support this process by modulating the frequency and granularity of feedback based on parents' increasing expertise in identifying and correcting errors. In parallel, these systems must also be designed with flexibility to avoid introducing stress or disruption. For instance, allowing parents to easily dismiss or "snooze" proactive notifications can prevent stress if feedback is delivered at inconvenient times. Just-in-time adaptive interventions [78], which tailor support based on contextual data such as the the child's emotional state, can help ensure assistance is provided when it is most helpful.

5.1.2 Fostering Parent-Child Engagement. To preserve meaningful parent-child interactions during home practice, AI systems should be designed to foster joint engagement rather than focusing solely on the child's interaction with the technology. Research highlights the importance of shared "positioning" and "ownership" in joint activities, where both parents and children actively contribute and monitor progress together [44, 108, 120]. For example, AI systems could include features that enable parents and children to complete tasks cooperatively, such as multi-touch interactions or progress dashboards visible to both parties. Incorporating collaborative tasks with adjustable difficulty levels can encourage shared problem-solving, similar to how physical tools like LEGO have been shown to foster spontaneous collaboration [44]. Translating these principles into speech therapy, AI-supported tools could gamify practice activities, prompting parents and children to alternate roles, such as coaching each other or working together to achieve a shared goal.

5.1.3 Reducing Parent Workload. A key challenge in designing AI systems for home practice is minimizing the additional workload

placed on parents, who are often managing multiple caregiving responsibilities. Excessive maintenance tasks, such as frequent calibration or error correction, and data management burdens can lead to frustration and eventual device abandonment [62]. To address this, gradual responsibility-sharing frameworks [53] can be incorporated, where systems initially automate error correction and updates before transitioning manageable tasks to parents. Additionally, leveraging familiar devices such as smartphones or tablets [3] can streamline maintenance by integrating into ecosystems families already use, reducing the cognitive load of managing new technology. Our findings further highlight the importance of streamlined data management. For example, SLPs raised concerns about the data burden in design concepts like *Therapy Organizer*, which might require families to upload detailed reports and interpret AI-generated progress data. To alleviate this, AI systems could automate data collection using passive sources like therapy session recordings. Voice assistants could complement these tools by offering plain-language explanations of progress summaries and suggesting actionable next steps [1, 101].

5.1.4 Ethical Considerations. Integrating AI for home practice raises important ethical challenges that must be addressed to ensure equitable and responsible use. One significant concern is algorithmic bias, which can arise if AI systems are trained on datasets that fail to reflect the diversity of speech patterns, dialects, and cultural backgrounds [48, 64]. For example, speech recognition systems may struggle with non-standard dialects such as African American English (AAE) or with children from non-English-speaking homes [58]. Our work advocates for expanding training datasets to include a broader range of speech patterns, dialects, and ages to reduce performance disparities across demographic groups. Additionally, ongoing bias audits using fairness metrics can ensure models are evaluated on diverse populations before deployment [117, 118]. Privacy and data security are equally critical. Given that AI tools may collect sensitive information about children's speech development, compliance with privacy regulations such as FERPA[4] and HIPAA[5] is non-negotiable. This necessitates proactive integration of privacy-preserving techniques to balance data utility with children's data protection. One promising approach is differential privacy, which introduces statistical noise to datasets to obscure individual identities while still enabling meaningful analysis [38, 54]. Homomorphic encryption offers a potential approach for improving the privacy of children's speech data by enabling encrypted computations, though practical implementations for real-time speech processing remain challenging [2, 79].

Finally, transparency and explainability in AI decision-making are important for both parents and SLPs. Parents expressed a desire for clear guidance on how to implement therapy techniques, and SLPs highlighted the need to ensure that AI systems provide reliable, evidence-based feedback. AI systems should be designed with explainable models, allowing users to understand how recommendations are generated and to trust that the advice being given is appropriate and accurate [7, 26, 39]. This is particularly important in the context of speech therapy, where precise modeling of articulation and pronunciation can have significant long-term effects on a child's development [26]. Additionally, SLPs in our study also emphasized the importance of maintaining professional oversight when using AI tools in therapy. By making AI systems more transparent, SLPs can understand how outputs are generated, assess their reliability, and avoid issues such as AI "hallucinations"—where AI might generate incorrect or misleading information [4]. This transparency would also allow SLPs to make informed decisions about the appropriateness of AI guidance, ensuring that the AI remains a safe and supportive tool [26, 106]. Clear, interpretable AI systems can help preserve the SLPs' role in overseeing therapy and empower them to make adjustments based on the nuanced needs of each child.

5.2 Limitations and Future Work

Our research examined different levels of AI oversight and how these technologies might expand support provided to parents. While our research gathered insights from parents and feedback from SLPs, we did not directly involve children as participants. This was primarily due to the readiness of the concepts being studied, which were not yet sufficiently refined or developed for younger participants. However, as these ideas continue to develop and more tangible artifacts are created, future work could involve children to better understand dynamics of parent-child interactions and how they co-navigate AI systems [37, 121] for home practice. Additionally, we did not collect data on parents' prior experiences with or knowledge of AI technologies, as familiarity with AI systems was not a prerequisite for participation. While parent participants imagined diverse AI solutions based on their needs, we could not determine the extent to which differences in AI familiarity may have influenced depth or specificity of their brainstorming. Furthermore, despite our efforts to recruit a diverse sample, we obtained a highly skewed gender distribution for our parent participants. The predominance of mothers in our sample, while unintended, is consistent with prior studies in family-centered research [21, 35, 84]. This may reflect broader societal patterns where caregiving responsibilities often fall disproportionately on mothers [36]. However, the reasons behind low participation of fathers in family-centered studies, including ours, warrant further investigation and discussion on how it can be addressed. Lastly, our study employed surveys rather than interviews to gather feedback from SLPs after developing design concepts. This methodological decision was made to reduce time burden and to allow for more convenient participation, recognizing the demanding schedules and heavy workloads of SLPs. Although we believe our survey approach allowed us to gather valuable data from a larger number of SLPs than might have been possible with interviews, we acknowledge the potential limitations in the depth of our findings.

5.3 Conclusion

This study explores the potential of AI-supported technologies in enhancing home-based speech therapy practices for children, focusing on the experiences and needs of caregivers. Through semi-structured interviews, we identified the challenges parents face in managing home practice such as balancing multiple therapeutic demands, replicating clinical techniques at home, and sustaining

[4]Family Educational Rights and Privacy Act
[5]Health Insurance Portability and Accountability Act

child engagement. We also identified key opportunities for AI to provide informational, practical, and emotional support to parents, ranging from high-oversight tools offering real-time feedback to low-oversight systems that aid in planning and coordination. We then developed six AI design concepts based on these insights and they were well-received by both parents and SLPs, who saw potential in AI to boost parent confidence, increase engagement, facilitate cross-setting collaboration, and save time. Our findings make a contribution to the ongoing discussion about the role of AI in supporting therapeutic practices, particularly in the context of speech therapy. Integrating AI into home-based therapy practices has the potential to empower parents, optimize the effectiveness of home practice, and ultimately improve outcomes for children in speech therapy. We hope this work contributes to creating a path for providing additional support to parents and SLPs, helping the children they care for meet their communication needs and reach their full potential.

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APPENDIX A

Below is the interview protocol used to gather insights from parent participants regarding their experiences with home practice.

Section 1: Current Practices.

(1) How long has your child been in speech therapy?
(2) How often does your child have sessions with the Speech-Language Pathologist (SLP)?
(3) In between sessions, what types of speech exercises, home practice activities, or carry-over homework does the SLP assign?
(4) Are there particular times or activities within your child's daily routine that naturally lend themselves to speech practice?

Section 2: Experiences with Home Practice.

(1) Tell us about one highlight and one lowlight with implementing home practice activities.
(2) Can you share any specific aspects of speech exercises that you find challenging to implement or feel unsure about during home practice?
(3) Imagine there's no limit to what AI could do—if an AI tool could be tailored to your needs, what features would it have to help you overcome this challenge in the most impactful way?
(4) Can you describe your child's engagement during home practice activities?
(5) Are there specific activities or tools that seem to capture their interest more than others?
(6) How do you manage any potential frustrations your child may experience during home practice sessions?
(7) In an ideal world, how do you imagine AI helping you make home practice more engaging for your child?

Section 3: Communication with the SLP.

(1) How do you typically communicate with the SLP when you have questions or concerns about home practice or your child's progress?
(2) Can you share any instances where you liked and appreciated the communication with the SLP? What do you think worked well?
(3) Can you share any instances where communication with the SLP has not been effective or has led to frustration?
(4) If there is more than one SLP, how do the different SLPs communicate with each other?
(5) Can you brainstorm ideas on how AI could improve communication and collaboration between you and your SLP?

Section 4: Tracking Progress.

(1) What aspects of your child's progress would you like more information or clarification on?
(2) Are there any specific tools or methods you use at home to track or observe your child's speech and language development?
(3) If not, how would you like AI to help you with progress tracking?

APPENDIX B

Table 6: Examples of Codes, Selected Subcodes, and Corresponding Example Coding

Code	Subcode	Example Coding
Home Practice (HP)	HP_information sources	*"I follow a few speech therapists on social media who post little videos of ideas."* (P11)
	HP_integration into everyday settings	*"We try to encourage him in the grocery store to say hello to people to try to be engaging."* (P4)
	HP_multiple therapies	*"He currently goes to two different types of speech therapy."* (P3)
	HP_support systems	*"I joined a whole bunch of different groups, like parent groups on Facebook."* (P15)
Home Practice Challenges (HPC)	HPC_parent expertise concerns	*"I just don't understand how I'm supposed to replicate it at home."* (P8)
	HPC_feeling overwhelmed	*"Being unsure where to prioritize because he is a kid who's working on so much."* (P11)
	HPC_environment discrepancies	*"He will not listen to me as good as therapist."* (P12)
Design Ideas (DI)	DI_parent expertise concerns	*"AI software device, that would have the knowledge that a speech therapist would have."* (P13)
	DI_feeling overwhelmed	*"It could be your personal assistant and just be like, oh, you're about to do this activity."* (P8)
	DI_environment discrepancies	*"Sometimes coaching or observing or something might be helpful."* (P11)
Parent Values (PV)	PV_human connection	*"I enjoy just communicating with her and seeing when she's responsive to."* (P9)

APPENDIX C

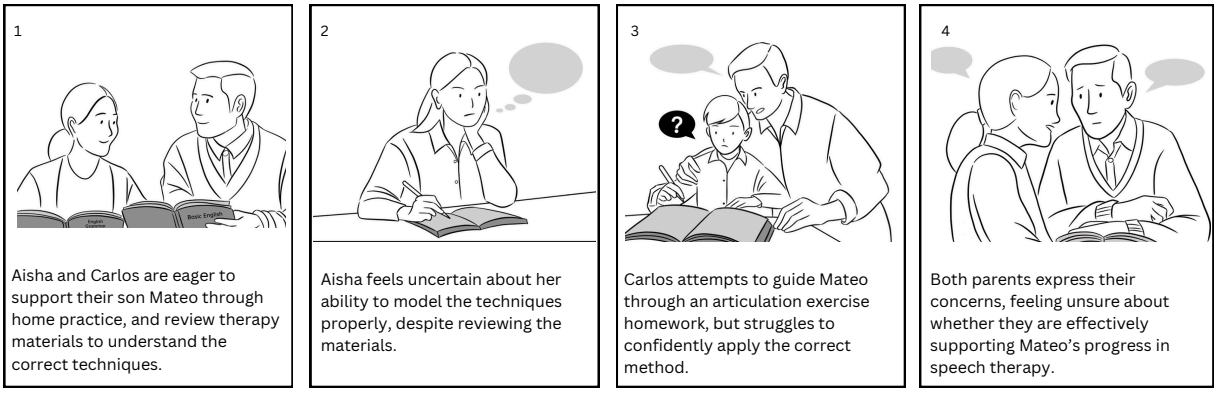

Figure 9: Storyboard illustrating challenges parents face in implementing therapy techniques during home practice.

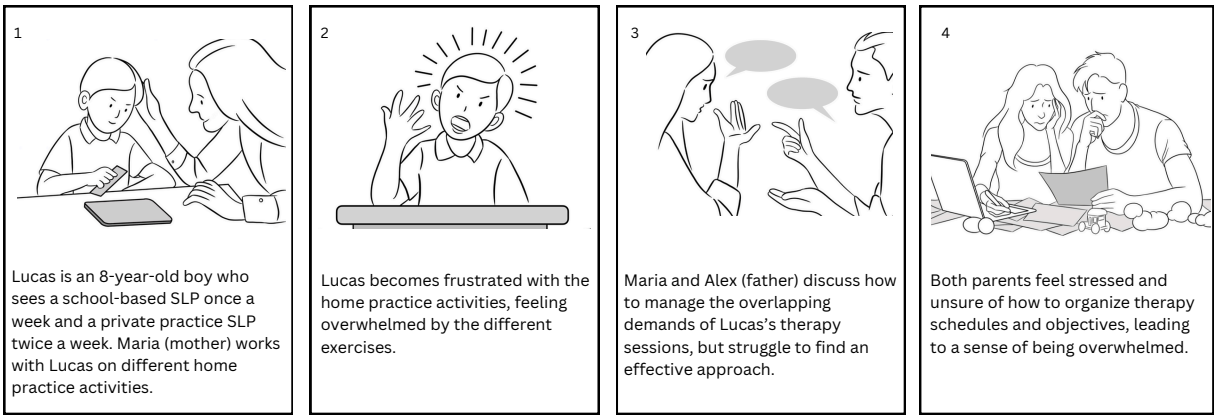

Figure 10: Storyboard depicting the challenges of balancing multiple therapy demands and activities for home practice.