Project Bridge

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Analysis:

1. Problem Description:
    a. **Background:**

There are many studies (Powell et al 2010; Sheridan et al 2011; Boonk et al, 2018; Barnett et al 2020; Henderson & Mapp, 2002; Gauvreau & Sandall, 2017) that show the importance of parent engagement in children's education and development, especially at a young age. In this scenario, parent engagement refers to active communication and collaboration with teachers that leads to linking in-classroom and at-home learning. This kind of engagement and partnership is shown to also have positive impacts on child development and school readiness (Galindo & Sheldon 2010; Sheridan et al 2019; Henderson & Mapp, 2002). School readiness refers to the idea that a child is prepared to enter kindergarten and elementary school. This crucial developmental period has long-term impacts on a child's social and academic development. Students who enter kindergarten behind their peers are more likely to stay behind for the rest of their academic career. One way to promote school readiness is through parent engagement and a parent-teacher partnership (Connell & Prinz, 2002).

Extensive literature shows that active parent engagement has positive long-term outcomes for children, impacting academic achievement (Fan & Chen, 2001), literacy, language, and math skills for preschoolers and kindergarteners (Powell, et al., 2012) child behavior and discipline (Sheldon & Epstein, 2002)**,** social-emotional development and mental health (Sheridan, et al, 2019), attitudes around education and school, and school readiness (Downer & Pianta, 2006)**.** Successful parent-teacher relationships can also help children create positive interpersonal relationships (Hmelak & Vodopivec, 1996), as well as help children understand what is expected of them in educational settings (Hoover-Dempsey et al, 2001). Early childhood centers that emphasize parent engagement or greater parent-teacher interactions see an increase in parents doing at-home learning activities with their children, as well as positive learning gains for the children themselves (Barnett et al., 2020; Sheridan et al, 2010).

Despite all the evidence that parent engagement and strong parent-teacher relationships are important in a child's development and level of school readiness, there are a number of barriers that impact parent-teacher communication. There is no shortage of motivation for parents to get involved, but many do not have the time, resources, skills, confidence, or agency to do so effectively**.** Additionally, parents may not be aware of the extent of these benefits and school systems and relationships do not often support them extensively. Parents may have preconceived notions about teachers and education based on their own experiences, while teachers might make generalized assumptions about parents (Goodall & Montgomery, 2014). Socioeconomic factors, such as income and education level, influence parent involvement

(Smith et al, 2013; Weiss et al, 2009). Teachers might be lacking time, resources, opportunities to further engage with parents, or the training to effectively do so (Goodall & Montgomery, 2014; Sheridan et al, 2019).

The Getting Ready Intervention, a randomized control trial that looked at parent engagement's impact on school readiness, used the ecological systems theory as the foundation of the intervention (Bronfenbrenner, 1979). This theory looks at how the various spheres of influence in a child's life interact with each other, specifically the home and school relationships. Bronfenbrenner argues that how families and schools cooperate and interact can impact a child's life. Because of this, "family-school partnership models focus on creating a constructive relationship to promote positive social-emotional, behavioral, and academic and developmental trajectories in children and youth, emphasizing the reciprocal influence and shared responsibility for educating and socializing children" (Sheridan et al, 2010).

Traditionally, parent school involvement has meant volunteering at school events or attending parent-teacher conferences. While these activities can improve child academic outcomes (Barnett et al 2020; Galindo & Sheldon, 2012; Powell et al, 2010), the traditional means of correspondence often creates a one-way relationship, with the school controlling the flow of information and the relationships (Goodall & Montgomery, 2014; Marsh 2003). Findings show that parent-teacher relationship initiatives are most effective when schools and families "embrace a philosophy of partnership" (Henderson & Mapp, 2002) and have accepted shared responsibility for the child's success. Studies show that parents who are engaged in at-home learning activities are "more involved in their child's early childhood and school settings, had more frequent communication with educators and rated educator communication effectiveness more highly" (Murray et al, 2014). We want to look at the two-way flow of information between parents and the school, as a way to increase confidence in parents and create better relationships between parents and teachers (Goodall & Montgomery, 2014; Henderson & Mapp, 2002).

Goodall and Montgomery argue for a "parent engagement continuum," where the goal is to improve parent engagement in a child's learning and facilitate greater learning and social outcomes for the child. To do so, they argue that parents need to have agency and confidence in their ability to help their child, which requires an increased flow of information between parents and teachers, as well as joint decision making. This information should not be "the simple transmission of depersonalized knowledge from one party to another. Instead, they need to be seen as complex communicative activities in which the participants actively represent their practices and interests" (Hughes & Greenhough, 2006).

Current communication applications revolve around school/class news or events, grades, student homework, and include two-way messaging for parents and teachers. However, few include methods, activities, and information for parents to use at home that go hand-in-hand with what is being taught in the classroom. Using the information gathered in this literature review, it seems that parents and teachers should be given background knowledge and strategies to better understand how the parent-teacher relationship impacts the child. Some

information that should be shared includes home-school collaboration strategies (i.e. what is going on in the classroom, ways to follow up at home), collaborative goal-setting and problem-solving in academic, social-emotional, behavioral, or health domains (Edwards et al., 2009), and data on the benefits of parent-teacher partnerships. Similarly, there should be structured communication that examines the different factors in the child's life and that allows parents and teachers to jointly identify problems and set goals. Given the barriers in place that might prevent parents and teachers from seeing eye-to-eye, it would be helpful for both parties to have guidance for how to establish a productive relationship. Activities that foster a deeper relationship between parents and teachers have proven to be useful tools in child development, as have activities that link the child's home life and classroom life in tangible ways (Hughes & Greenhough, 2006).

b. Problem Statement:

The problem we are addressing is the lack of a system that fosters two-way communication between parents and teachers at the preschool level. There is not a system in place that puts both parties on equal footing, in terms of their relationship to the child's learning, and helps both parents and teachers understand how the parent-teacher relationship impacts the students. Many preschool parents also lack the confidence and agency to support their child's learning and also lack the knowledge about why their involvement is important.

Preschool is a crucial part of a child's development and can predict their long-term academic, social-emotional, and behavioral development and achievement. Bridge wants to help close the achievement gap by helping all parents understand the importance of their role in their child's overall development. We want to bridge the gap between the classroom and at-home learning, in a way that facilitates two-way communication between parents and teachers and helps parents become more actively involved in their child's education and development. This two-way relationship will also help teachers get a fuller understanding of the child, their at-home life, and what skills or lessons are transferring to other areas of their life. Folding these elements - two-way communication, at-home learning, understanding the benefits of parent-teacher relationship - into one app will make it easy and efficient for both parties to communicate and develop a relationship. These factors are inextricably linked, meaning they need to be looked at and solved as one problem, which is what we hope to do by foster parent-teacher collaboration and the home-classroom link.

2. Target Audience

a. Parents of early learners

In 2018, 60% of the three- and four-year-olds in the U.S. were enrolled in preschool and about 40% of those children were enrolled in private schools (Bauman & Cranney, 2020). The median income of households with preschool students was $84,000. Of the students enrolled in

preschool in 2018, 66.8% of preschool children were white, 20% were Hispanic, 13.6% were black, and only about 5% were Asian (Bauman & Cranney, 2020).

All parents want their children to succeed, be happy, and do well in school. Studies have shown that "students of all backgrounds gain when their parents are involved" (Henderson & Mapp, 2002). However, it's important to acknowledge how the diversity of parents will result in a variety of skill, confidence, and involvement levels. Parent demographics, such as socioeconomic status, ethnicity, education level, language, and cultural background, can impact how involved parents might be in their child's education, with parents with higher socioeconomic status or more education being more likely to be engaged (Hill & Taylor, 2004; Murray et al, 2014; Henderson & Mapp, 2002). Similarly, parents who had negative experiences with their own education are more likely to develop negative relationships with their children's teachers or school or may be less comfortable making their voice heard in a school setting (Goodall & Montgomery, 2014; Hill & Taylor, 2004). In general, parents' confidence, self-efficacy, and self-perception can affect how involved they are in their child's education (Henderson & Mapp, 2002). A parent's mental or psychological state can also impact parent involvement, as mothers with depression are shown to be less involved (Hill & Taylor, 2004).

Preschool parents often lack the time, resources and skill set to express themselves in school settings (Tveit, 2009; Lawson, 2003). Parents may not be aware of the role they play in their child's development or may not have the time to be actively involved. Parents also face the challenge of balancing their authority as a parent and the authority of the school and teacher, which can cause parents to doubt themselves and feel insecure (Nakagawa, 2000). Parents' perception of their role as a parent and what is expected of them will impact how involved they become (Henderson & Mapp, 2002). These issues often lead to parents taking a passive role in their child's school education and some parents view preschool teachers as service providers or babysitters (Tveit, 2009). On the other hand, some parents may be overly involved in the child's education and expecting too much of the teacher, in which case, they will need some boundaries around communication.

b. Preschool/Kindergarten Teachers

In 2018, the average salary for preschool teachers was $24,560, which is less than half of the average national salary of $53,888. There were 580,000 preschool and kindergarten teachers working in the U.S. in 2018. Most preschool and kindergarten teachers are female (97.4%) and 61% are white. About 16% of preschool and kindergarten teachers are Black, while 6% are Asian and 5% are Hispanic. The average age of a female preschool teacher is 38.5 and the average age of a male preschool teacher is 36.5 (Data USA, n.d.).

Preschool teachers are expected to play an active role in their students' education (Tveit, 2009). This expectation can make teachers view the parents' beliefs and ideas as less legitimate and push them aside (Tveit, 2009; Goodall & Montgomery, 2014; Oostdam & Hooge, 2012). Teachers rarely expect to learn anything from parents (Tveit, 2009), though teachers are also expected to establish the level of parent involvement and give parents the opportunities to

express themselves (Hmelak & Vodopivec, 2015). Teachers also might judge families based on their parenting techniques, their school involvement, etc. (Smith & Sheridan, 2018).

As noted above, preschool teachers are significantly underpaid. Teachers often do not have the time or resources to foster parent-teacher relationships and get parents actively involved (Hill & Taylor, 2004). Some teachers are not fully prepared to embrace new technologies in classrooms because they have not been taught how to utilize technology tools effectively. Teachers struggle with incorporating technology into their pedagogy to scaffold students' learning.

3. Learning Context

a. Spatial, Temporal, and Social:

In the U.S., preschool is not a right. It is a privilege afforded to those who qualify, live in states who offer universal preschool, or have the money to pay for it. However, it is highly sought after, due to the fact that preschool is crucial in school readiness for children. Without accessible or effective early education, students can enter school far behind their peers. In 2017, the National Institute for Early Education Research found that children enrolled in inadequately funded preschool programs entered kindergarten behind their more advantaged peers (NIEER, 2017). In recent years, funding for public preschools has increased, as has preschool enrollment in most states. Some states still do not offer state-funded public preschools.

Given the breadth of differences in preschool in this country, there are a variety of social and cultural contexts to consider. Parents in this day and age are also extremely competitive, regarding where their child goes to school, starting as early as preschool. This is also fueled by the limited number of quality preschool programs, but is more prevalent among higher-income, college-educated populations. This learning environment/app will need to fit into public and private preschool education and support both lower-income and higher-income parents. It will also need to fit succinctly in with any preschool curriculum. Given how busy both parents and teachers are, we want to design an app that will seamlessly fit into their daily routine and will not be an additional burden.

In most modern classrooms, the current digital communication platforms allow parents to experience "observant intimacy," as defined by Lauren Erdreich. The apps on the market create a "parent-child connection based not on co-participation but on parental gaze, as facilitated by teacher's intervention" (Erdreich, 2019). The teachers are the mediators and the parents are not encouraged to respond or give their insight in response. This relationship and social dynamic is an important part of the issue, as it goes beyond classroom technology. As noted above, parents are expected to be passive participants in their child's learning, despite the evidence that shows that their involvement is important. Meanwhile, the teachers are meant to be actively involved in a way that might be over-burdening them.

b. Technical:

Our product will be available as a mobile application. This is because 81% of American adults own smartphones and about 20% of Americans use smartphones as their primary means of online access (Pew Research Center, 2019a). Having this product as a mobile application will make it easier for parents and teachers to integrate into their daily lives and routines, as 90% of cell phone owners say they "frequently" have their phone on them (Rainie & Zickuhr, 2015).

There will be varying levels of comfort with technology across the learners, meaning the app will have to be intuitive and easy to use. Some parents and teachers will be extremely comfortable with technology, likely those that are younger. We plan to use easily recognizable icons and buttons to help all learners navigate through the app.

4. Learning Goals & Objectives:

a. Goal:

We want to boost school readiness and child success by bridging the gap between classroom and at-home learning, facilitate two-way communication, and create a strong partnership between parents and teachers. Through our app, we hope to establish a didactical partnership, in which parents are informed about and involved in their child's learning process and teachers will be supported and better able to address individual child needs (Oostdam, 2012).

Goals for parents:

1. Increase parents confidence and self-efficacy in engaging with learning at home with their children
2. Understand what to communicate with teachers and how and why this level of communication is important
3. Help parents understand their role in their child's development and how the parent-teacher partnership can support this

Objectives:

Objectives for parents:

1. After frequent use of Bridge, parents will know what to communicate with teachers and how to do so.
2. Parents will apply their knowledge of the importance of their role by prompting communication with teachers. Parents will be in more frequent communication with teachers.
3. Parents will apply their understanding of the school-home learning connection by implementing at-home activities with their children.
4. Parents will evaluate their child's development and goals, through communication with the teacher.

Goals for teachers:

1. Increase teachers' understanding of the importance of the parent-teacher relationship and how to foster it.
2. Understand what to communicate with parents and how and why this level of communication is important.
3. Help teachers understand their role, as well as the importance of the parents role, in childhood development and how the parent-teacher partnership can support this.

Objectives for teachers:

1. After frequent use of Bridge, teachers will know what to communicate with parents and how to do so.
2. Teachers will apply their knowledge of the importance of their role by prompting communication and engaging in an increased number of conversations with parents.
3. Teachers will evaluate student development and goals, as well as their own professional development.

5. Review of competing/existing projects:

Product	About	Parent-Teacher Communication
SeeSaw	Seesaw is a student-driven digital portfolio that allows students to showcase their work and their thought processes in real time. Seesaw helps teachers see and hear what each student knows so they can better understand student progress. There is a library of activities and teachers can assign specific ones for students.	SeeSaw allows for teachers to share student work with parents, message parents, send newsletters, or create announcements videos.
Bloomz	Bloomz makes it easy for teachers to securely share photos, classroom updates and reach parents instantly through messaging, as well as to coordinate events (like PT Conferences) and sign up for volunteers.	Bloomz offers tons of communication features for teachers to relay information to parents and schedule events. Most of the features promote a one-way flow of communication.

HiMama	HiMama is a preschool administrative app that allows for early childhood educators to complete preschool daily reports, schedules, attendance, check-ins and meal planning. It also allows for sending parents daily sheets, pictures, videos and invoices.	HiMama has features that allow teachers to easily share updates and information with parents, as well as message with parents. The features promote a one-way flow of communication.
ClassDojo	ClassDojo connects primary school teachers and families through communication features and sharing. It creates a portfolio for students and allows for students to work on activities out of school. Their library of at-home activities is available through a subscription service that is often not available through the school's membership.	ClassDojo is like social media for schools and families and allows for easy sharing of student work and activity. ClassDojo also allows for parent-teacher communication, though again in a way that promotes one-way flow of information.

a. What can you learn from existing projects?

When we typed key words like parent communication, preschool communication in the application store, aforementioned applications were at the top of the rank. Different communication applications focus on different perspectives of communication. Some focus on teacher-student interaction, some focus on teacher-parent interaction.

However, we found that applications that provide service for teacher-parent communication often facilitate one-way communication, which means teachers do the majority of work. Teachers need to send parents updates through the app, but parents are not sending updates about home learning or other relevant child updates. One review of SeeSaw even noted how parents could be more engaged with the activities and content. We believe that parents are passively accepting information, rather than actively facilitating communication. In this scenario, information and communication technology fail to provide deeper communication between parents and teachers.

b. Why do you need a new learning environment?

From what we can tell, the communication apps on the market for parents and teachers offer neither information on why parent-teacher relationships are important in childhood

development, nor strategies on how to effectively communicate. Thinking about the “parent engagement continuum,” most of these operate at the first point, in which the school or teacher controls information and it flows one way for the most part (Goodall & Montgomery, 2014). We think it’d be more effective, given the literature review, to establish two-way communication between parents and teachers, which will help parents build agency and confidence. This kind of communication will also provide teachers with more knowledge on each individual student and will help them understand how to better support their students. Ideally, it should make it easier for teachers to focus on each student’s needs. As research has shown, programs that support the idea of a partnership between parents and teachers are more effective in improving child outcomes (Henderson & Mapp, 2002; Erdreich, 2019).

Design

1. Content Analysis

a. Description of the Content

Snippets

The content in our application will hit on a few different subject areas. All content within the app will be written for easy readability. Primarily, we want to convey to parents and teachers why they should be communicating with one another, while also helping them understand how they should be communicating. To do so, we plan to have easily digestible pieces of information in the app that explain these two main ideas. These bits of content, which we call Snippets, will include facts about the importance and benefits of their partnership, prompts for starting conversations, and questions to help them recall previous knowledge. There will also be content around why at-home learning is important, how parents can easily implement activities into their routine, and how teachers can link it with classroom learning. Additionally, Snippets will include information on appropriate parent-teacher communication boundaries and will help both users set expectations around their relationship.

Example Snippets for Teachers:

Teacher snippets include information from the literature review about the benefits of parent-teacher relationships and why teachers need to help foster these connections. Some examples of content that we will share with teachers through the app (these examples and the parent snippet examples are not yet modified for the appropriate reading level):

- Parent involvement can lead to literacy gains and help reduce the achievement gap in average literacy performance (Dearing, et al., 2004)
- Teachers have special insight into the needs and development of children and can help parents understand how to tackle tough issues (Powers, 2016)
- Parents can offer teachers a clearer understanding of their child and can help teachers understand their expectations for their child (Hill & Taylor, 2004)
- Parent-teacher relationships can increase the effectiveness of involvement at home (Hill & Tyson, 2009)
- Having a teacher foster and encourage parent involvement can result in greater competence among parents, when it comes to learning (Epstein & Dauber, 1991).
- A quality relationship between parents and teachers can improve the quality of a school (Henderson & Mapp, 2002)

Example Snippets for Parents:

Parents also need to understand the importance of their relationship with teachers, while also learning how they can promote their child's learning on their own. We will include content that tells parents why they should collaborate with their child's teachers. Examples:

- Parent-teacher relationships can help children form positive social-emotional behaviors (Sheridan, et al, 2019)

- Parental engagement is associated with language development in young children
- Parent engagement in a young child's education is correlated with lifelong positive academic performance (Downer & Pianta, 2006)
- At-home learning activities help prepare children for kindergarten
- Parent involvement is shown to increase school readiness
- A parent's ability to communicate their expectations for their child's education and discuss learning with their child is shown to have a positive impact on student achievement (Hill & Tyson, 2009)

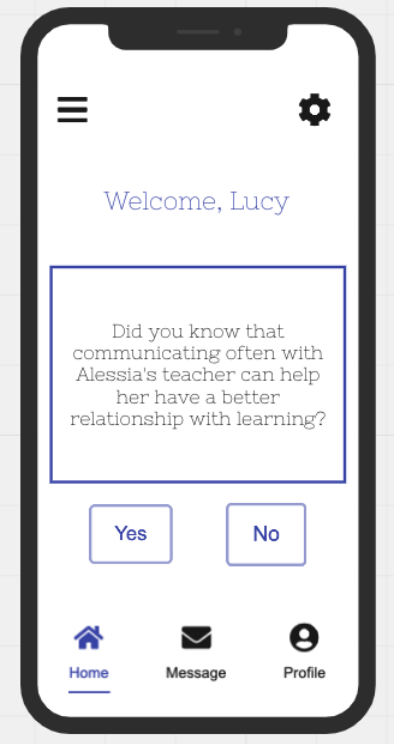


Image 1: Example of a Snippet on the parent side of the app

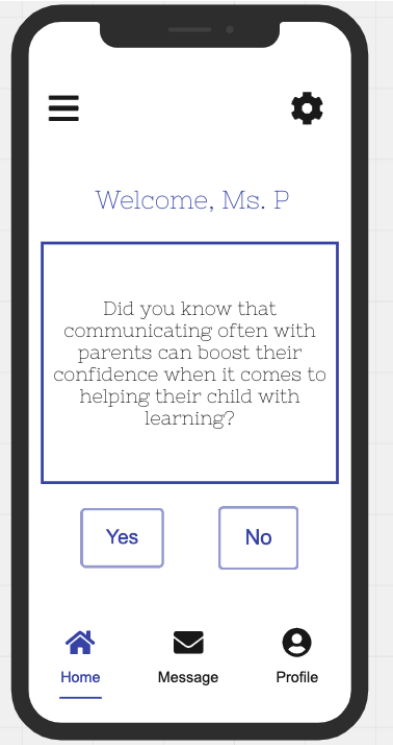


Image 2: Example of a Snippet on the teacher side of the app

In-App Messaging:

The actual messaging system on the app will have prompts and templates to help parents and teachers craft conversations. These prompts will help focus the conversation, while also bringing up topics that parents or teachers maybe wouldn't normally think to discuss. Parents and teachers will be able to navigate through buttons to lead them to appropriate conversation starters. For example, they might pick the topic they wish to talk about (cognitive development, physical development, social-emotional, school issue, home issue) and then that will further filter to offer appropriate templates or prompts. The app will also allow for regular messages, without prompts. Also, as the system learns more about each specific user and their

actions within Bridge, it will be better able to identify the solutions and recommendations that teachers should send to specific parents, based on their child's abilities and goals.

We will use push notifications to remind parents and teachers to send messages. Similarly, if a parent is messaging a teacher more than 3-4 times a week, the system will push Snippets or reminders about how a successful partnership does include some boundaries. We want to make it clear to parents that while the parent-teacher relationship is important, teachers have many students and limited time, emphasizing how an important part of this relationship is respecting their time. Teachers can also set "online hours" on certain days or at certain times, when parents can expect to hear back from them.

Example of In-App Messaging Interaction:

Parent Side of Bridge:

Once the parent has interacted with the snippet, they are brought to a second page, which is where the communication process will start. Parents will see a variety of choices. When they select a choice, that will branch into more options related to that topic. This will help the parents tailor their messages, while also tagging the message with the related filters/subjects. These filters will be used to provide teachers with their related responses and will also be used as a way for parents or teachers to search through their messages. Finally, they will be given a longer prompt to send the teacher that they can also add their own text to. Below is a possible example of what the parent will see when they click through the communication options.

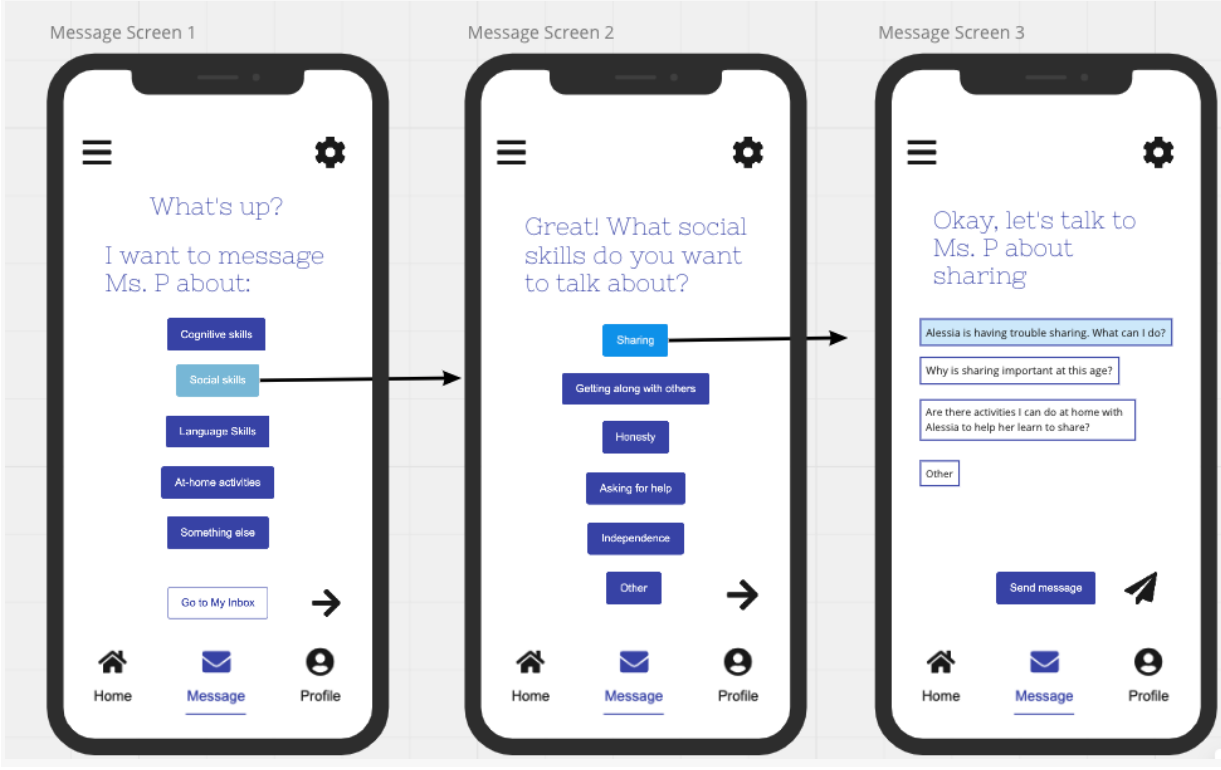


Image 3: Example of Parent In-App Messaging - prompts

If the parent pressed on the other options on Message Screen 1, they would see options relating to that topic. Following the example above, each button would further tailor the prompts. Examples:

Cognitive Skills:

1. Counting
2. Colors
3. Comparing and sorting items
4. Memory
5. Drawing

Language Skills:

1. Basic grammar
2. Speaking
3. Early letter writing
4. Telling stories
5. Making predictions about stories
6. Listening skills

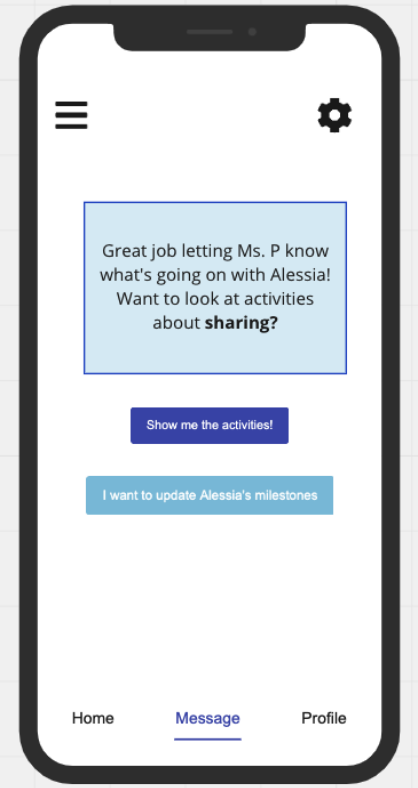


Image 4: Example of parent feedback pop-up

Feedback:

After the parent sends their message, they receive a feedback pop-up. These pop-ups will be constantly changing and will be based on information pulled from the system about how the parent is using the application and how they could be using it more effectively.

Teacher Side of Bridge:

When the teacher logs in, they will also see a Snippet, as shown in image 2. Following this, they will have options to check their inbox or send out other messages. If the parent sent the message outlined above, the teacher can open that message. The system will provide recommended responses. They can also add their own text to these responses. The responses will be based on the “filters” assigned when the parent clicked through the buttons. Teachers will also have the option to add specific activities or additional info to the parents, based on their request. Once the teacher responds, they will also receive feedback from the app, similar to the parent feedback, and can respond to other messages or update development trackers.

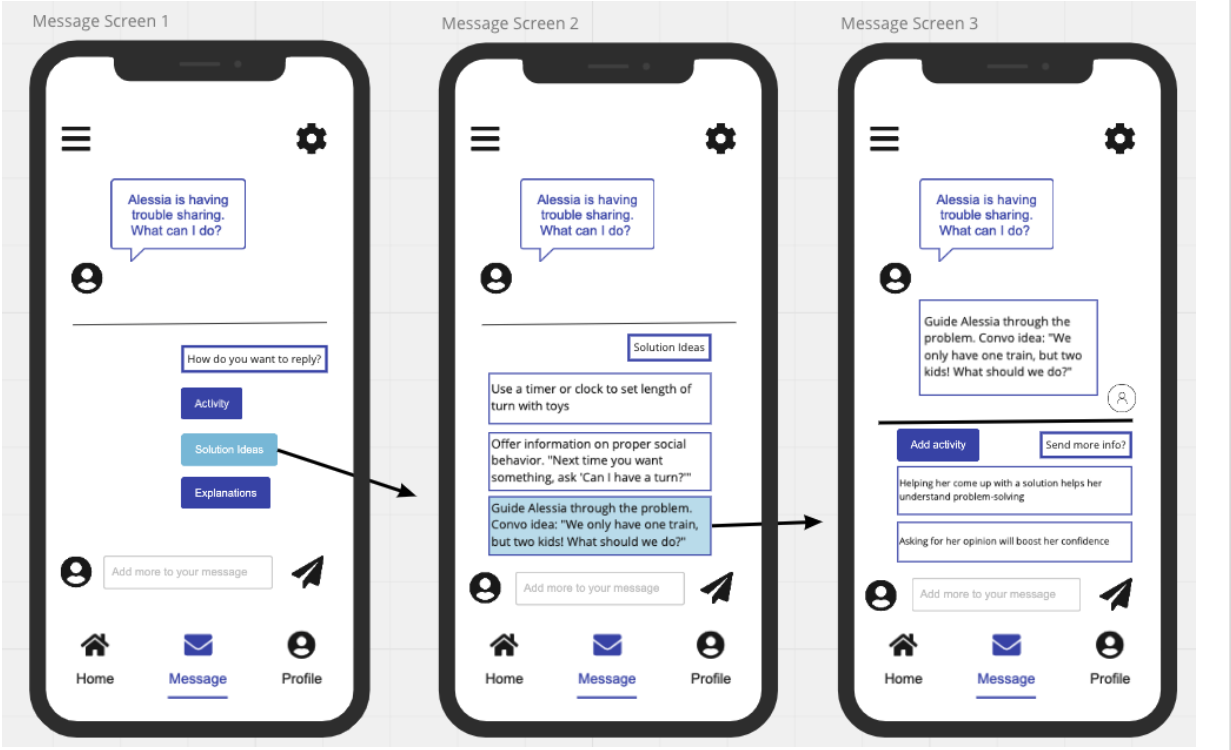


Image 5: Example of Teacher In-App Messaging - response options

Milestone & Goal Tracker:

There will be a milestone and goal tracker. The milestone/goal tracker will include checklists on child development - cognitive, physical, social-emotional, etc. These will be based on the child's profile and age. Parents will be able to indicate if their child is consistently, inconsistently, or not at all hitting these milestones. These milestones will be based on well-researched goals for this age group and can be updated to fit with state standards for preschool. This will help teachers and parents work collaboratively, create a partnership, and better link at-home learning and classroom learning to better assist child development.

At the beginning of the year, parents can pick specific goals for their child within the app that will be part of the child's overall profile. We will recommend that parents and teachers have one in-person or phone call to establish ways of working towards these goals. Alternatively, early conversation prompts will be about specific goals and milestones for each child. To make this and other group messaging easier for the teacher, the system will pull this information about each specific child from their profile. For example, if the teacher wants to send out a mass message to the class that shows up as personalized messages for each parent, they can choose a prompt and the system will fill in the remaining information, such as the child or parent name, the specific goal they're working towards, or a milestone they just hit.

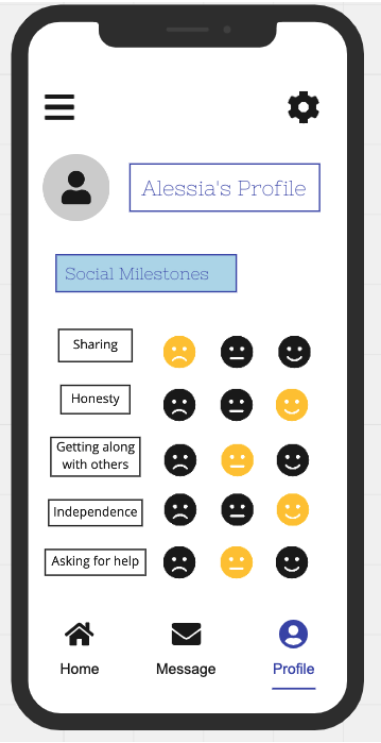


Image 6: Example of Milestone/Goal Tracker

Student Profile:

The student profile will also be a place where parents or teachers can upload pictures or videos, write notes, or keep a joint journal. After clicking on an activity, parents will be prompted to upload a photo or quick note about completing the activity with the child. Parents can also check off activities after they've done them, which will be tracked in an activity log. This information will help the teacher know how the student is doing outside of class and what to focus on with them. Teachers will also be prompted to add information about the child's activities in class to help parents link their at-home activities and feel empowered as part of their child's learning. All of this user activity will be used by the system to create and push out specific conversational prompts or snippets, such as specific Snippets about an area where a child is struggling or an activity to help reach a milestone.

At-Home Activities:

The app will be connected on the back-end to a library of relevant at-home activities for parents and children. This database will be collected from resources across the Internet, such as Education.com, Wide Open Schools, and other similar websites. An ideal partnership would be with Teachers Pay Teachers, a database of more than 3 million teacher-created resources for all ages. On the teacher-side of our app, they could have full access to this library of resources and assign (or make visible) relevant activities for their classrooms or individual

students. When parents access the library, they would initially be prompted towards the assigned activities, but could also view the rest of the library.

All activities will be tagged for the subject areas they relate to. This allows parents and teachers to use filters to sort through the Activities Library. It also allows teachers to easily send individual parents activities based on their specific concerns or goals. When parents click on activities, whether in the broader Activities Library, in the Recommended Activities, or in their messages, there will be accompanying information. This information will be about the activity's benefits and where it fits into the child's development. For example, an activity about sharing might have information about how sharing is part of a child's social-emotional development and reasons why it is important for children to master. As with all content in the app, it will be written at or below a 7th grade reading level.

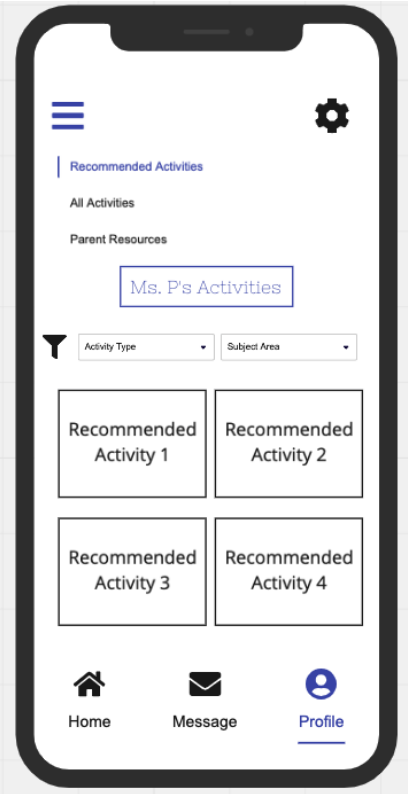


Image 7: Example of At-Home Activities Library

2. Media selection

a. Description of the media and delivery platform

We will be developing a mobile application that connects pre-k teachers and parents. This application will allow users to communicate directly through the application. Most messaging tools or applications are accessed and used via smartphones, making a mobile

application the natural choice for Bridge. For both parents and teachers, they can share important messages through the app anytime they need to. This application will both be available at Apple application store as well as Android app store. It is designed to fit all types of smartphones, thus parents and teachers can communicate boundlessly.

b. Why was the media/medium selected?

Mobile applications can give users a sense of community, and we want to differentiate this application from other social media. It is designed for teachers and parents to communicate and collaborate with each other. Most American adults have a smartphone and are on it frequently. As a mobile application, it will be easy for parents and teachers to integrate the learning into their daily lives and routines. We are hoping that a mobile application keeps Bridge from becoming a burden for parents or teachers. All of the content is fairly concise and we will use interactive prompts to tailor the content towards the users and their specific needs.

Push notifications will remind them to complete certain tasks or send a message and the overall user design is meant to be efficient and not take too much time out of a busy day. Having access to Bridge from a mobile device will also allow users to easily take photos or videos and share them on the Student Profiles, quickly update goals or milestones, or pull up an at-home activity.

Some challenges to using a mobile application as a medium will be smartphone, Wi-Fi, and data access. While we know that most adults own smartphones and that 73% of American adults have broadband service at home (Pew Research Center, 2019b), there are also racial and socioeconomic discrepancies in access. Adults with lower socioeconomic status and lower levels of education are less likely to have broadband at home, as are racial minorities or adults living in rural areas (Pew Research Center, 2019b). Many rural areas lack the infrastructure for high-speed internet. Similarly, 40% of schools in the U.S. lack broadband access (Winslow, 2019)**.** Limited access to technology or broadband can create educational digital divides and cause students to fall behind their more advantaged peers (something we clearly saw during COVID-19). Therefore, using a mobile application may create an equity issue for our users, as rural or lower-income households and schools may be less able to use the product.

3. Project Description

Learning Theory

This project is based on cognitivism. We need to help teachers and parents learn **what** needs to be communicated, as well as **how** to communicate. Cognitivism considers how learners acquire knowledge by looking at various complex cognitive processes and internal mental structures. This approach emphasizes the importance of hierarchical task analysis, structuring information in an optimal way, active involvement of the learner, and creating meaningful learning environments (Ertmer & Newby, 1993, pg. 60), all of which are key components in achieving our goal. Cognitivism looks at how learners process, store, and retrieve information and instruction should “communicate or transfer knowledge to the students in the most efficient, effective manner possible” (Ertmer & Newby, 1993).

We want to help both parents and teachers have the understanding and the agency to continue this relationship. It'll be important to structure and sequence information in a way that allows parents and teachers to build on their prior knowledge. We want to be able to support both parties in a way that works for their needs, as well as in a way that helps them organize and connect new information. Using a predetermined path in the app will help move parents and teachers through the various mental structures, in a way that allows for them to make connections with past knowledge.

Instructional Design Theory & Description of Overall Functionality

Gagné's Theory of Instruction is based primarily on cognitivism and suggests how instruction should be laid out, in order to facilitate specific cognitive processes, such as attention, encoding, and retrieval (Reiser & Dempsey, 2017). The various events of instruction, as defined by Gagné, are meant to help learners process information by guiding their attention, stimulating recall, and providing guidance or feedback. Our project is primarily based on this instructional design theory, as it provides support for facilitating the internal cognitive processes that we are hoping to foster. We also plan to employ multimedia theory, which assumes that humans process auditory and visual information in two different channels and combining the two effectively can help diminish cognitive load (Reiser & Dempsey, 2017). Using a combination of videos, verbal cues, animations, and pictures, we can hopefully make it easier for parents and teachers to understand the information we are presenting them.

Using a cognitive approach, we want to create a predetermined path for the user to take. This means that the app will be pre-loaded with content, where the child should be in their cognitive development, and include templated information for communicating. Parents and teachers can just click and send the information. Another key characteristic is that we want the app to be helpful for parents of all skill and education levels. In the design, this includes scaffolded examples of how and what to communicate (also built into the above approach).

Following Gagné's events of instruction, we want to first gain the learner's attention. When users first create an account at the beginning of the school year, they will take a short self-assessment about their confidence, communication preferences, and other skills. They will also then be shown a short animation on the benefits of parent-teacher relationships and linking home and classroom learning. This will inform the learner of the objectives and a short automated walkthrough of the app will present the stimulus to the learners.

When the learner logs on every other time, to focus the learner's attention on the desired outcomes and to remind them of the objective, the first screen of the app will be the Snippet, a short piece of information on the benefits of communication or a prompt to guide their communication. To facilitate recall, this will occasionally be a question or activity to remind the parent or teacher of prior knowledge or to further assess their confidence or knowledge. Periodically, this will include self-assessment questions to better understand what has been learned. Based on the self-assessment and the learner's actions, the system will recommend further activities or learning materials. These prompts will also serve as extrinsic motivation,

reminding parents and teachers of why they are working to build a relationship and link home and school.

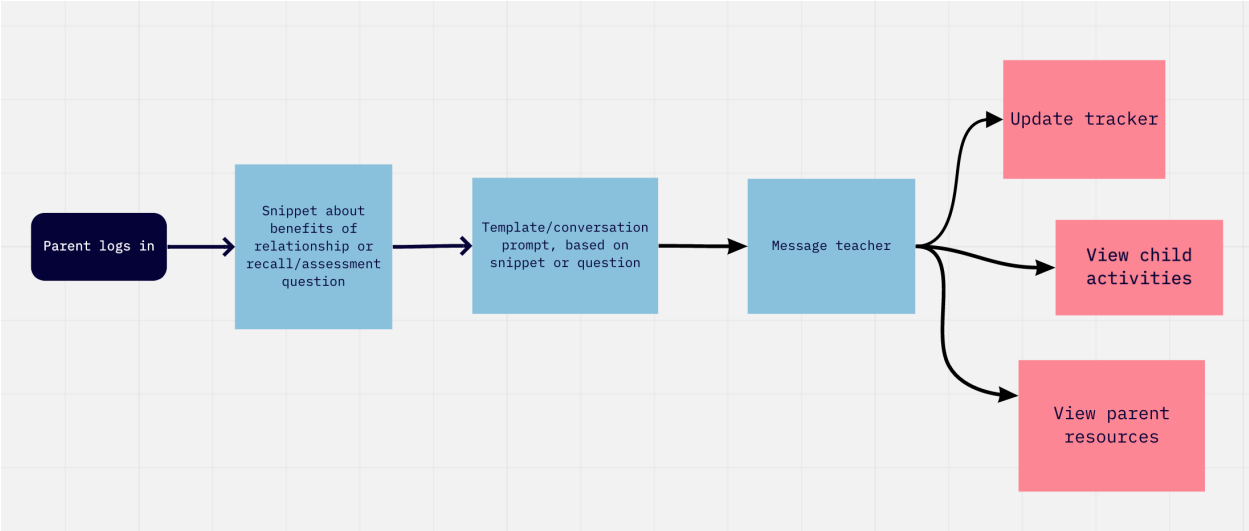
To provide learning guidance and metacognitive support, the messaging system will have prompts and templates to help them effectively communicate and learn communication strategies. The prompts will also act as cues to help them independently understand when they should be communicating and about what. The actual messaging will allow learners to perform what is being learned, but there will also be a library of activities or information to help them, if they need more support. The app will also relay feedback, based on their activity, such as “Good job!” following a message or a further prompt to improve their actions. Bridge is also designed to align with teachers and parents’ goals. Using goal and development trackers for both parties, as well as for children, parents and teachers will be able to track their own understanding and learning. The ability to set goals or make plans will help support learners to facilitate self-regulated learning, as well as providing further metacognitive support (Azevedo, 2005).

Because we want to increase parent self-efficacy and agency, motivational and metacognitive strategies will play a big role in our design. Similarly, we want to help parents and teachers develop self-regulated learning (SRL) skills to be able to efficiently and effectively communicate, without ongoing support. Both parents and teachers are intrinsically motivated to do what is best for their children/students. However, we want to help them contextualize their role in the child’s development. To do so, we want to promote extrinsic motivation to help parents and teachers understand why their communication and collaboration is important for student development. This will be addressed by that first Snippet screen that users see, with information, questions, or prompts. For parents, this will be information on how at-home learning and working with teachers have long term gains for students and help close the achievement gap (Reiser & Dempsey, 2017). For teachers, we will want to communicate how increased parent-teacher interaction might improve student outcomes and make the teachers job easier. This will help parents and teachers contextualize what they are learning.

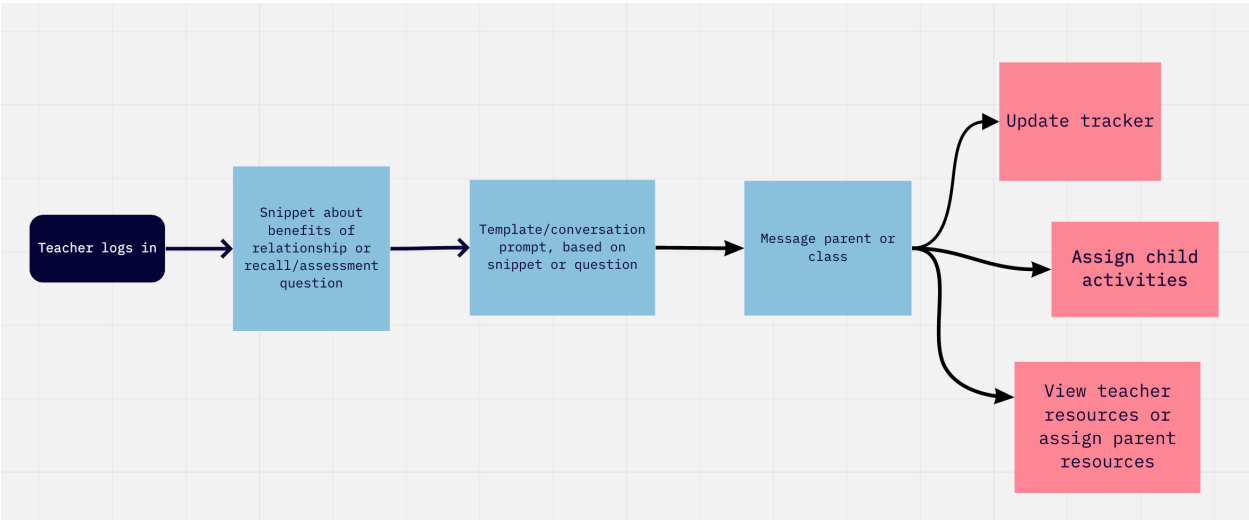
4. Design Documentation

a. Flow chart of overall project

Parent flowchart:



Teacher flowchart:



b. User Experience Design

Information Design

In order to help parents and teachers best understand and process the content, we plan to employ simple-to-complex sequencing, in which the broadest information is presented first (Van Patten et al., 1986). As the learner spends more time on the app or engages in more activities, the information prompts will get more complex (while still being written in accessible language). This helps the user appropriately structure and organize information without getting overwhelmed. Similarly, we plan to structure the prompts as micro-sequencing, which research shows to be most effective when sequenced as a generality, an example, and then practice

(Van Patten et al., 1986). The informational screen will include a generality and often an example, while the message will be the chance for practice. Ideally, the informational screen will relate closely to the messaging prompts offered that day. The messaging system will also include examples, in the form of templates and prompts.

Interaction Design

Our design is user-centered, as we want to make the app fit into the learners' lives, rather than the other way around. In our design, we plan to use easily recognizable icons and buttons to help guide users. The words we use in the prompts, templates, and informational screens will be carefully selected and tested with users. We need to determine the correct amount of words and kinds of words to best communicate our objectives to parents and teachers, while still being easily digestible and at the appropriate reading level. The average American adult reads at a 7th-8th grade reading level. Therefore, we will write all snippets, prompts, teacher solutions, and feedback to be readable at or below this grade level.

We will also use visual and audio feedback to help guide our users. There will be visual cues to lead them through our predetermined path, as well as audio feedback when they send messages. We also plan to employ the use of constraints on the interactions available to the learners. We want to keep them on this specific path and going through the necessary cognitive and metacognitive processes.

The system will respond based on what buttons are pressed by the users. This is key in the use of the prompts. Based on the prompt selected, the system will push out other related prompts to further tailor the content. For example, when the parent presses the "social skills" prompt, they will see prompts about sharing, independence, etc. Similarly, based on the prompts selected by parents or teachers, the other party will see related prompts. For example, in our prototype, the parent selects "social skills" and then "sharing." These selections tag the message, so that when the teacher goes to respond, she sees prompts that relate back to the parent's concern. This functional works both ways. It also allows parents and teachers to filter their message history for specific concerns and they will be shown messages related to that issue.

The system will be designed in a way that the various user interactions prompt certain system responses and feedback. For example, how the users respond to Snippet questions or information will determine the complexity of their future Snippets. The system will also sometimes tailor Snippets based on the messages sent between users. This will use the message "tags" or filters to note areas of greater concern for users and push out Snippets or Feedback based on this. This will also help to contextualize the information for users in a way that they can understand. Bridge will also recommend activities to users based on the past activities they've clicked on or interacted with.

Bridge will also use push notifications to remind parents and teachers to use the app, to send messages, or implement activities. It will also remind parents to update their child's goals and milestones and suggest activities based on the child's progress towards these goals. Our goal is to link the various components of the application in a way that synthesizes the overall learning for users and continuously promotes their cognitive understanding. Teachers will also receive monthly reports about how parents are doing in terms of interacting with and

understanding the content, allowing teachers to provide extra support for those who might be struggling.

5. Implementation

a. Plan of implementation

Adoption:

There are four ways to adopt innovations in K-12 schools - complementary (a combination of top-down and bottom-up adoption) administrator-driven, teacher-driven, and then voluntary. According to Petko, Egger, Cantieni, and Wespi (2015), complementary implementation is the most effective way to adopt a new technology in school. We will reach out to both schools and teachers to market our product. Because of how preschool is set up in the U.S., we will not need to go through the Department of Education. We can directly contact public and private preschools and their teachers.

Using the User-Oriented Instructional Development (UOID) framework, we would first identify our potential adopters as preschools and other early childhood centers, as well as individual teachers. To measure adopter perceptions, we are going to survey preschool teachers and administrators before design begins. This will help us to better create a user-oriented product. We plan to survey teachers and administrators nationwide on their needs and concerns, as well as about their adoption and implementation requirements. To create a user-friendly product, we will integrate this feedback into our initial design, while also conducting usability testing throughout the design process with preschool teachers to ensure that we are meeting their needs and accounting for their ideas and perceptions.

The next step in the UOID framework is to inform the potential adopters. Once we are satisfied that our design meets user needs, we will follow up with the teachers and administrators that we surveyed at the start of the process. We will also recruit potential adopters by contacting preschools across the country and attending various educational conferences and events. We will offer workshops, tutorials, webinars, and other forms of information sessions to introduce these potential adopters to our product. Not only will these sessions include walkthroughs of the app, but we will also present to teachers information about the benefit of parent-teacher collaboration and how to efficiently incorporate this application in their daily practice. We will also use short animations or instructional videos to circulate amongst teachers with information about why Bridge is important and how easy it is to implement into their daily lives, without added stress. We want to show teachers why this app is a better way of communicating than other digital applications with observable benefits for them as teachers, as well as for their students. We will also offer post-adoption customer and technical support for schools, parents, and teachers.

Since we are concerned with the readiness to adopt an application like this, our adoption outreach will focus on providing explicit and quantitative information on achievement gaps and school readiness. This includes highlighting statistics such as how students who enter kindergarten behind their peers are more likely to stay behind for the rest of their education. We will present evidence-based information and emphasize how parent-teacher partnerships can reduce these achievement gaps. We will also include information about how current messaging

apps on the market create an unbalanced role between parents and teachers, which is detrimental to their partnership. We will create short videos and marketing tools that present this information in an easily digestible way. We will then present Bridge as the easy alternative and a possible solution for reducing the ever-expanding achievement gaps. We will also make it clear that Bridge is meant to be an efficient tool, one that has system supports to keep it from becoming a burden for the users, especially teachers.

Our implementation plan includes ensuring the availability of resources and time. One part of the adoption will be making sure enough teachers and parents in a given preschool have access to a smartphone and Wi-Fi or a data connection. While in-school Wi-Fi is not crucial to the implementation of Bridge, since it does not need to be used during school hours, it would be an asset for teachers, especially in rural or lower-income areas.

Implementation:

The stakeholders involved are teachers, parents, and preschool or early childhood centers. Following a school's adoption, we will offer tutorials and training services to administrators and teachers. Schools will be assigned an account manager from Bridge. Their account manager will make sure that the school as a whole receives the number of requested teacher accounts. We will provide instructional videos, online support, or in-person support to help each teacher set up parent accounts.

Given our concern with parent and teacher readiness to adopt and implement such an app, an important part of our implementation plan will be creating a knowledge base for both parties. This will include short, playful animation videos that give parents and teachers the baseline information they need to understand the importance of their relationship, communication, and engagement. Upon adoption, schools and teachers will be given access to a wealth of resources on this subject and early communication from Bridge's account managers and newsletters will highlight this information. It will also be stored in the "Parent & Teacher Resources Library" within the app. Using the idea of simple-to-complex sequencing, the Informational Snippets will begin with this baseline information, which will help orient both parties to the purpose of the app. Also, at the start of the school year, parents and teachers will complete in-app surveys about their understanding of parent-teacher communication, as well as their general concerns and worries or perceived gaps in their knowledge. The system will use this information to tailor Snippets to each user, as a way to help them grow more comfortable with the app and their overall understanding of the problem.

We will also provide teachers with scheduling tools and templates to help Bridge fit into their classroom. These tools will allow teachers to easily select and "schedule" activities for parents ahead of time. To fit in with the school curriculum, a teacher may want to recommend at-home activities that align with the in-school content. However, we want teachers to be able to do this easily and not have to frequently worry about updating the recommended activities. Therefore, they can pre-schedule the activities, which will then show up in the "recommended" section on the date the teacher selects. In an additional effort to reduce the burden for teachers, we will provide clear guidance for parents new to Bridge about how often they should be

communicating with parents and making sure they neither excessively message the parent, nor do they expect the teacher to respond at all hours.

When looking at the conditions that contribute to successful implementation, we plan to focus on knowledge and skills, rewards, availability of resources and time, and dissatisfaction with the status quo. Through informational videos, meetings with the account manager, and the Snippets, we will provide stakeholders with the knowledge and skills to use the app, while also showing them that they already have much of this information and highlighting how Bridge is there to help them implement this inherent knowledge. These resources will also help provide rewards and incentives, as it will clearly outline the benefits of their partnership and communication. In terms of dissatisfaction with the status quo, workshops and disseminating information regarding the benefits of parent-teacher collaboration would be used to help the users understand what could be improved. Training materials, short animations and product walk-throughs, and by-request training sessions would help the various users understand the technology and become comfortable with it. The rewards and incentives are made clear from the start, as we will make it clear how this product benefits their children or students. To support stakeholders, we plan to offer customer and technical support for both parents and teachers. We will also offer easily understandable user guides and animations to help with potential problems as they arise.

6. Evaluation

a. Evaluation plan for the learning environment

We want to evaluate the usability of Bridge, as well as its ability to meet the learning objectives. Before we begin building the application, we will survey preschool teachers and parents from around the country, to better understand their needs and perceptions. We will also employ subject matter experts to help implement these needs. Throughout the design process, we will recruit participants who fit the learner profiles (both teachers and parents) and perform usability testing. These participants will vary in location, income, education-level, socio-economic status, race, and gender, to provide a varied sample for our ongoing testing. This will include traditional user experience tests around interactivity and flow of the design, including A/B testing.

Users will receive a survey when they first install the application, and they will receive another survey after their first semester using the application. Users will receive another survey at the end of each semester to help determine how the app has served the learners over the past few months. Users can also give feedback anytime through the help button on the bottom of the homepage. This survey will be used to create a baseline regarding parent confidence and understanding at the start of their Bridge usage, which we will later compare to their ongoing self-reports every semester. The following questions will be presented on the survey.

- Application usability: ask if teachers and parents are satisfied with the user experience. What's the most and the least satisfying function and why?
- User confidence: ask if users feel confident using the application, and if it has made them more willing to reach out to the other party.

- Student improvement: ask if students benefited from teacher-parent interaction and collaboration.

b. Evaluation of the learners

Before release:

The first part of our learner evaluation is our needs assessment, which will include a more extensive literature review, as well as surveying and interviewing teachers and parents nationwide. We will conduct both summative and formative evaluation for our project. Following Dick, Carey, and Carey's formative evaluation process, which is typically used for self-instruction, we will first work one-on-one with at least three learners of varying abilities. In our case, we plan to use six learners - three teachers; three parents. After gathering the results from these meetings, we will make changes and test the instruction without the support of another person. This second phase will test the changes by having a small group use the app, without support from an instructor or designer and conduct a post-test. Finally, following changes from phase two, we will implement a field trial evaluation. We will use 30 learners for this phase. Each of these phases, we will use the input from the teachers and parents to craft better, more relevant and effective instruction within the app. This will include the content used in the Informational Snippets, as well as the conversational prompts and solutions.

Prior to nationwide app release, we will implement Bridge in a sample of classrooms. These classrooms will vary in location and demographic. We will have parents and teachers in select classrooms use the app over a semester, while other classrooms will be randomly assigned as a control group. These classrooms will be given access to a different build of the app that only contains the At-Home Learning Activities Library, the goal trackers, and a simple messenger. This build of Bridge will not include the supporting information, snippets, or conversation prompts. We will use pre- and post-implementation surveys to measure if self-reported parent and teacher confidence, agency, and understanding significantly changes after using Bridge. We will also measure overall time spent on the time, the number of activities marked as completed, the number of messages sent between parents and teachers, and which party more frequently sent the first message. This will be collected from back-end data on both apps.

Using the student profiles and milestone trackers, we will also measure child development over time. This will be based on how well the child is progressing towards goals and how parents and teachers are marking different developmental goals. While this will not necessarily correlate directly to Bridge's intervention, we can see if there are major changes with children over time. We will compare the goal and developmental progress of children in the control group (without the informational snippets) to those in the treatment group. Ideally, we would hope to see greater progress towards goals with the treatment group, as parents and teachers would be collaborating towards goals together. Following this study, we would use the information found to make any necessary changes to the content or application design.

After release:

Once the application is implemented in classrooms nationwide, we will continue to measure and evaluate its effectiveness. We will still have new users take pre-surveys when they

first download the app, as well as short surveys at the end of each semester. These surveys will still look at confidence, agency, understanding, and app usage feedback.

We will also use the Snippets to evaluate users. Occasionally, the Informational Snippets will include questions with multiple choice answers about the content. Other times, the Snippets will be “did you know?” style questions with “yes” and “no” buttons. The answers from parents and teachers to these questions will be used to evaluate the success of Bridge’s content and ability to meet one of the major learning goals - to help parents and teachers understand the importance of their roles, their partnership, and their communication.

We will continue to use the milestone trackers to follow student progress, though this will be even harder to correlate without a control group. Using back-end data, we will measure the number of messages sent, how frequently parents and teachers communicate, and which party initiates the conversation. We will also use the messaging system to determine if the communication is bidirectional and whether or not parents and teachers are meaningfully engaging in conversations. Using additional interactivity data, we will measure if these conversations lead to greater activity usage.

We will also randomly sample back-end data to track user’s interactivity within the app. Following a user’s path, we will determine how they use Bridge and if they are using it in the way we intended. For example, we will track whether or not users click on activities, if a teacher suggests one in their conversation. We will track if a conversation on a specific topic leads either user to update the milestone tracker. We’ll also look at how often users access activities, if they follow-up with questions after using them, and if activity usage is based on how frequently they communicate with the teacher or what they communicate about.

This user data will be simplified and streamlined for teachers to use to evaluate their students and to further support parents, if they feel that is necessary. Teachers can use the student profiles, journals, and milestones for their own evaluation purposes. This can be helpful for teachers in understanding what worked or did not work in supporting a child’s goals. They can then implement this knowledge with other students or future classes. Similarly, they will also be given data regarding how often activities are clicked on by parents and they will be able to see parent reflections and ratings for these activities. Based on what parents are or are not interacting with, teachers can better tailor their in-classroom content or their messages for parents. They can also find activities that they think might be more engaging.

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