Starting an Intergenerational Technology Design Team: A Case Study

Kendra Knudtzon[1], Allison Druin[1], Nancy Kaplan[2], Kathryn Summers[2], Yoram Chisik[2], Rahul Kulkarni[2], Stuart Moulthrop[2], Holly Weeks[2], Ben Bederson[1]

[1]Human-Computer Interaction Lab
University of Maryland
College Park, MD 20742
USA
+1 301 405 7445
kendra@cs.umd.edu

[2]School of Information Arts and Technology
University of Baltimore
Baltimore, MD 21201
USA
+1 410 837 5319
nakaplan@ubalt.edu

ABSTRACT

This paper presents a case study of the first three months of a new intergenerational design team with children ages 10-13. It discusses the research and design methods used for working with children of this age group. The challenges and opportunities of starting a new team, and the lessons learned are discussed.

Keywords

Children, intergenerational design teams, educational applications, cooperative inquiry, participatory design, design methods

INTRODUCTION

Based on the research techniques pioneered at the University of Maryland [7, 8, 9], children are more commonly emerging as design partners in creating new technologies for children. Numerous researchers from around the world (e.g., US, UK, Sweden, Canada, Netherlands) have begun to use partnership techniques in creating everything from school websites [17] to digital libraries [5, 9, 11] to handheld technologies for children [12, 16] to storytelling environments [1, 2]. As these research practices become more common it is important to understand how these intergenerational partnerships are formed, and the challenges and rewards of such partnerships. Therefore in this paper, we will reflect on the personal experiences, power structures, research and design methods, and team reflections during the first three months of establishing an intergenerational design team.

Design Partnerships

Partnering with users has been an accepted design practice in creating new technologies since the late 1970s. Scandinavian co-design practices brought together trade union workers with researchers to develop appropriate technologies for work environments [3]. This philosophy has been adapted for partnerships with children and called *Cooperative Inquiry* [7]. At the University of Maryland, researchers have worked on developing partnership techniques for children ages 4-11 over the last five years. Children are integrated into the research process as active partners. They are considered critical members of the team who bring their particular strengths and experiences to the research process [8]. Research methods are adapted to better suit children in the design process. During Cooperative Inquiry research, children and adults write in journals, work on low-tech prototypes, brainstorm on paper or sticky notes, draw pictures, and think about how technology should change [7, 8].

Establishing a New Partnership

Our intergenerational design team is the result of a partnership between the University of Baltimore (UBalt) and the University of Maryland, College Park (UMD). The new Baltimore team focuses on extending the University of Maryland's Human-Computer Interaction Lab's (HCIL) Cooperative Inquiry research. This three-year research project, supported by the National Science Foundation (NSF), hopes to explore educational technology for children ages 10-13, primarily in the digital library domain. The UBalt team consists of three professors and three graduate students from UBalt's School of Information Arts and Technology (SIAT), one UMD computer science graduate student, and six children, three boys (ages 10-11) and three girls (ages 11-13). The three professors and the UMD graduate student previously participated in a 2-week intensive summer design session with the UMD design team in preparation for starting the UBalt design team. This experience served as a model for how a successful team should function, but did not provide assistance with the mechanics of starting a team from scratch.

Our team's current research is centered on extending the International Children's Digital Library (ICDL) [11, 4] to support children ages 10-13. The University of Maryland's design work on the ICDL has currently been focused on use by children in early elementary school. As such, the current ICDL interface has no support for keyword search

and has search categories that may not correspond to older children's ideas of how a library should be structured. We have been exploring how older children think about books and reading, how they think about the current ICDL interface, and how they would change the library to better support their peers.

In the sections that follow we describe our team, the structure of this case study, our research activities, the challenges and issues we faced as a new team, and the lessons learned during our startup period.

TEAM STRUCTURE

We did not use any 'magic formula' for selecting members for our design team. We found it difficult to find children ages 10-13 who were able to make the time commitment necessary to be a member of the team[1]. Therefore our children were not systematically selected. Instead, we found them through professional connections and word-of-mouth. The three UBalt graduate students were selected based on the quality of their graduate school applications to SIAT, not their particular interest in educational technology. Because of the emphasis on teaching in the university[2], these students did not have their own research interests, but were selected in order to give them experience with HCI research methods. The UMD graduate student was selected to serve as a bridge between the UBalt team and the UMD team for her interest in educational technology. The professors were self-selected to the team.

With all of the adults coming from technology-focused departments, there is not much diversity of academic fields reflected in our team makeup. However, as part of the partnership with UMD, our design team receives on-going support and feedback from Dr. Allison Druin, a leader in this field of interaction design for children, which helps us maintain an interdisciplinary focus, even with a technology-based team. The UMD partnership allows our team to leverage support from the other disciplines of the UMD team (like education and library sciences).

The whole team meets once a week, on Saturdays for three hours. During the Saturday sessions, we include one major focused activity, usually one or two minor, less-structured activities and snacks, at the start and/or after a major activity. In addition, the adult team members meet once a week to reflect on and plan the activities of the team. Two of the professors and the UMD graduate student have a separate weekly conference call with Dr. Druin in order to integrate her feedback on the process and activities.

[1] At this age range it may be particularly difficult to recruit children to work with because they are often overly committed to other activities.

[2] The University of Baltimore is a teaching institute with traditionally little experience with research projects in this area.

STRUCTURE OF THE STUDY

The data presented in this paper comes from participant observation during the formation of the new partnership, both from adult partner meetings and Saturday design sessions. Additional data sources were journal writing (by child and adult design team members) during the three months and team reflections and interviews at the end of the semester.

COOPERATIVE INQUIRY ACTIVITIES

Most of our activities were adapted from those experienced during the 2-week intensive summer design session in College Park. The UMD team has demonstrated successes with low-tech prototyping, sticky notes sessions, and journal writing [1, 7, 8]. In this section, we discuss the types of activities conducted with the older children, which activities were successful, and the modifications made for these activities.

Figure 1: Low-tech prototyping

One low-tech prototyping method that has been quite successful for our team is "bags of stuff." With this design method, small teams of 2-3 children and 2-3 adults use a collection of materials (art supplies like paper, scissors, glue, markers, or pipe cleaners as well as random 3-d items like clay, sponges, or paint rollers) to build technology prototypes. The UMD team tends to need little specificity of purpose for low-tech prototyping sessions (researcher's notes, 2002). However, we have found when exploring designs with our team that the group needs to have specific questions to guide their activities. It is easy for our children to get off task and shift the focus away from educational technology when broader questions are asked. For example, the question "What would a digital library look like for older kids?" led to designs focused around video games, as seen in figure 2.

Figure 2: Video game controller interface

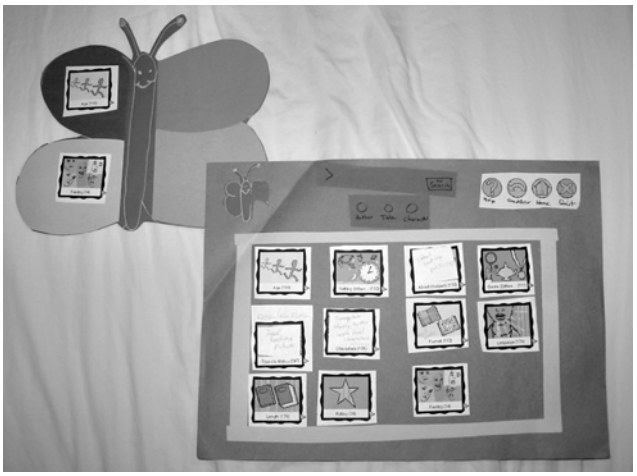

Figure 3: Butterfly interface

This response is opposed to the more detailed relevant designs (one of which is depicted in figure 3) that resulted from the series of specific questions, "How would a typing interface for older kids be added to an existing library design" or "What parts of the current library are too 'young kid-like' and how would we change them for older kids."

Sticky notes, an activity where design partners reflect on "likes", "dislikes", or possible changes to a design or interface on little notes, was a successful research method for the older children. The sticky notes allow team members to jot down ideas, which can easily be grouped by related ideas. These groupings can then be reflected upon and helps the team understand trends, problems, successes, and future work. While everyone occasionally grumbles about writing sticky notes, children and adults on our team have recognized their usefulness for thinking and reflecting together.

IDEO's brainstorming with rules [13] was a research method that we experimented with for the older children, specifically to help elicit better listening and elaboration within the team. The technique uses five simple rules: one conversation at a time, stay focused, encourage wild ideas, defer judgment, and build upon ideas from others. The goal of the activity is to come up with many ideas in a short amount of time. In this approach, there is one facilitator who introduces a topic to the group for brainstorming and reminds the team of the rules as they brainstorm. By changing who acts as facilitator and focusing on coming up with many ideas in a short amount of time, listening and elaboration were enhanced. In fact, in one ten-minute session, our team came up with more ideas than they did in most other one-hour brainstorming activities.

Existing research discusses the different ways in which adults and young children keep research journals and finds that young children will typically take notes by drawing and annotating pictures [7]. While journal writing has worked well with the younger children, so far it has only been partially successful with the older children. The adult members have not found a good time to schedule it into the design sessions, so we lose the opportunity to have the children record their thoughts in writing during many of the sessions. Also, many of the children on our team dislike writing and drawing. However, the children recognize the benefit of the journal: one 12 year-old girl reflected that she would feel more like a researcher by spending "more time thinking and writing in journals"(researcher's notes, 2002). Other design partners felt keeping track of their ideas was good, but thought they should be typing their ideas on the computer, rather than writing in journals. We are planning to set up a preliminary system that will allow the children to experiment with on-line journaling.

CHALLENGES

Conducting successful research design with our new team required us to overcome a variety of challenges. These included organizational structure, group dynamics, and physical space. All three will be discussed in the sections that follow.

Organization and Team-Building

During the first three months together, our team had a loose structure for the Saturday sessions. This affected our ability to accomplish many of our goals, causing some frustration for the adults and children on the team.

For example, most Saturdays when the children arrived at the lab, they would immediately log into the computers and play video games or surf the Internet. This was challenging for the team in several ways. The children would become engrossed in the game and it became akin to a punishment to stop the games in order to begin design activities. The violent video game activities that the boys on the team played also tended to set the wrong mood for our design sessions. In addition, with each child on a computer, this meant that team members did not talk informally with other team members. Many of the children did not even remember each other's names from session to session.

Another example involved snack time. We tried to include one or two snacks during our design sessions to give the

team members a little break and boost energy levels. We made the mistake during some Saturday sessions of eating snacks in the course of completing design activities, which both reduced the effectiveness of the activity by distracting the children and missed an opportunity to use snack time as a collaborative or team-building experience.

We quickly recognized these organizational issues, but expected them to be resolved as we became accustomed to working as a team. In addition, we considered it important to give the whole team a sense of purpose and early accomplishment, and thought the way to do this was by focusing on doing 'real work.' By thinking this, we created a situation where the pressure to conduct meaningful research competed with team-building activities as we initiated our design partnership. Despite advice from Dr. Druin to focus on initially building a strong team, our first two months were primarily spent pursuing research agendas, ultimately in a rather inefficient manner. Due to a lack of team-building activities we weren't truly becoming accustomed to being a team until later in the semester when we shifted our focus to include more team-building activities. This shift quickly alleviated our organizational issues and made us question why we didn't focus on team-building activities from the start.

This shift occurred two months into the project when the adults finally realized that many of the children did not know each other's names. There was frustration due to the loose organizational structure and the fact that many of our activities were not producing successful results. For example, in an attempt to help promote teambuilding and elaboration, one of the children from the UMD team, who had been a member of that team since its inception five years ago, joined us one Saturday to participate in a low-tech prototyping design session. From the start of the activity, his team of 3 children and 2 adults split their activities, not really listening or discussing each other's ideas. He quickly gave up on the activity and quietly worked alone, later confiding: "it's really bad if they can get *me* to stop listening." After the session, he talked with the UMD graduate student about team-building activities and the need for more listening and discussion.

The weeks after that visit, our team switched the focus to team building activities. We worked on interviewing other children and splitting into smaller teams, where we focused on specifically listening and elaborating on others' ideas. This is when we introduced "brainstorming with rules", which helped the team to listen to each other, and work together as a team to come up with ideas. We also spent more time talking about our lives and interests outside the team, starting each session talking about the past week in order to better understand each other's roles on the team. We re-structured our schedule so that we had a small snack in the beginning of our session and again after our major design activity. In addition, we were able to use the launch and publicity of the ICDL [4, 15] to talk specifically about the benefits of working in a design team, which helped give the children ownership and pride about the work they were participating in.

Interestingly enough, getting the children to spend more time away from the computers (where they have tended to work individually) has helped the children to focus on the team and seemingly has lead to better design ideas. Finally, as our design partnership was beginning, we struggled with how to give children a sense of ownership over the process and outcomes of research. We intuitively felt that it was important that the children feel ownership of our projects. However, it was challenging to have any immediate products resulting from the children's design work due to the long-term nature of this research project. This challenge partially solved itself with an accidental success: the creation of individual websites for each of the child design team members.

Group Dynamics

Really listening or paying attention has been a challenge with our team. While the adult leaders of the team have noticed it, and have tried to select activities that help promote listening, it continues to be a challenge. Part of the problem may be related to specific personalities on the team, since we did not have the advantage of actively selecting people for the team based on their abilities to work well with others in this capacity. One encouragement is that over half the team has recognized that they do have difficulties with listening and it is "something they need to work on as a design partner" (researcher's notes, 2002).

Another challenge we faced in starting our design team was in eliminating the power structures that typically exist between adults and children. We wanted the adults and the children to feel a strong partnership. All the adults on our team were concerned with not being too "teacher-like" when leading activities and tried to work on making sure that children's voices and opinions were heard and represented in all team meetings. However, this only worked to a certain extent. In many activities, the adults tended to dominate the discussions, letting their ideas take over the design sessions. This has been recognized, but as one of the adults remarked, "…being good at leading activities is a self-selected behavior that in many circumstances is welcome, so it is difficult to break that behavior" (researcher's notes, 2002).

Despite self-awareness on the part of the adults, the children have not noticed a power differential. Perhaps this is due to the fact that the structure of the team is very different from school, and they have more say than they would normally expect. At the end of the three months, before breaking for the winter holiday each team member

reflected on their role within the team, and five of the six children felt that they were equal partners on the team.[3]

However, these end-of-term team reflections brought up surprising factors about the dynamics of the adults. We had focused so much attention on making sure that the children felt like equal partners that we had not considered the power differential between professors and graduate students. The UBalt graduate students were being taught in class by the professors at the same time as they were trying to establish the design partnership for research. This led to some difficulty with the shyer student members not being entirely comfortable to speak their mind about the design team process, especially as they were not familiar with the research process and were still learning about what it means to be doing research.

"School-mode"

A challenge that we encountered working with older children is that they seem to get caught up with "what is not possible" and having "the right answers." The older children seem be very ingrained in the ways of school. For example, one Saturday we asked the children to try out a library scavenger hunt explaining that the activity would introduce them to the ICDL and that they should focus on the interface and if it was easy to use. After asking the adults if they would be graded, we stressed again that the answers were not important, that we wanted them to make notes about how the interface worked. Yet the children sped through the task, competing to see who could finish first, compared answers to see who was "right", and wrote all scavenger hunt answers in full sentences. Despite our efforts to explain otherwise, the children emphasized the scavenger hunt task instead of the interface process. Another challenge is that our children were overly concerned with what has already been done, and worried about limitations. For example, one 11-year-old boy working on a low-tech prototype was concerned that his design "might take a lot of megabytes" and not be feasible (researcher's notes, 2002).

In comparing our team with the younger children at UMD, we have observed that the younger children did not seem to worry about limitations and came up with wild idea when brainstorming. For our team, however, it has been difficult to help the children understand that there aren't always right answers, especially in research. While experience with the research team has helped some, there is room for improvement.

Physical Space

Another challenge in starting a design team is one that may seem surprising: the physical design of the room in which we meet. First, we would like to be able to sit on the floor while working together. This forces a certain physical proximity while also allowing a team flexibility to spread out. However, our space is linoleum (not carpeted), which makes sitting on the floor uncomfortable and undesirable. Secondly, we would like a lab space that is "kid-friendly." This includes having wall and shelf space to display children's work as well as space to gather for team-wide discussions and presentations. However, our primary working area is very small, broken up by a pillar in the middle of the room (as seen in figure 4), and there is little space to place our team's prototypes where they could be visible to the children and adults on the team. Where possible, we have tried to make the physical environment conducive to working with children. For example, we have installed whiteboards where the children could reach them, but we were unable to improve the environment as a whole.

Figure 4: Our lab space

Lastly, we would like a modifiable space in order to facilitate small as well as large group activities. While none of these items were provided in our dedicated lab space, we managed to relieve the space issues by using an open classroom down the hall. However, the classroom is not carpeted and we have to carry any necessary materials to the room.

TEAM REFLECTIONS

In reflecting on the first three months of partnership, all members of the team were interviewed by the paper's first author for 10-20 minutes. In addition, the team was asked to use sticky notes to list the three things they were proud of as a design team member and the three things they thought they needed to work on as a design team member. Based on these reflections, we found that all of the adults expressed some concern about pushing the kids too far and leaving more time for fun activities or free time (to design personal websites). Three of the adults thought they still needed to work on listening, and five felt that they needed to improve their research methods (taking better notes, thinking of more or better activities, more reflection and analysis of team efforts, thinking out of the box). During interviews, the adults expressed surprise about the children acclimating so quickly to the process, and noted that the

[3] The sixth said she felt like she was "helping out", but wasn't quite a partner yet.

adults' acclimation was not as strong. Children's actions during our team activities suggest when they need breaks, and the adults on the team feel that they have become accustomed to reading those signals. Three of the adults felt that maybe they needed to have more fun with the process.

None of the children mentioned in their interviews that they thought we were not having enough fun. When interviewed, all of the children thought being a design partner was fun. Three children expressed pride in being on a team and being involved in cutting edge research. Four of children were proud that they came up with good ideas to share with the team. They were reflective about their roles on the team, with four realizing they need to talk more or be less shy about sharing ideas, and three specifically discussed needing to pay more attention or listen better. Two children thought they talked too much about off-topic subjects, and worried about disrupting the rest of the team. One of the girls on the team completely dispelled the adults' thoughts that we need to have more fun, saying the team needed to pay more attention to building things, and that we (the children) need to be more serious. She explained that the process can't all be fun, because "if you're going to make something you need to make it right" (girl, age 12, researcher's notes, 2002).

LESSONS LEARNED

Based on our experience and the literature in this area, we have come to see that many factors affect the success of a new intergenerational design team. In this section, we present the lessons we have learned that may suggest guidelines for others starting their own intergenerational design teams.

1) Cooperative Inquiry methods are successful with older children, but additional brainstorming structures may be needed to help them think more creatively.

We have extended the UMD findings of success with Cooperative Inquiry methods to a sample of older children. While similar design activities have worked in our team, we found modifications to some activities enhanced success. It was helpful to "brainstorm with rules" before starting the "bags of stuff" activities in order to help children and adults think outside the box. We also increased the focus on encouraging ideas that are not limited by perceived notions of what is possible. Our findings support the theory that the Cooperative Inquiry methodology can serve as a baseline for working with intergenerational teams of all ages.

2) Older children can support the design of new technologies in ways younger children can't.

When designing technology for children it is necessary to work with children of all ages to ensure an age-appropriate design as well as to leverage from their varied experiences and thinking processes. We have found that older children can consider problems with a greater depth than is available to younger children and their experience with life, school, and school-related activities can give them different insights during the design process. For example, when looking at the design of the current ICDL system, our children questioned why the interface did not support reading for school. This included activities like book marking, finding books of a certain length, taking notes for book reports, and providing sample reading comprehension questions.

3) Child design team members need to feel a sense of project ownership.

We have found that a new design team can have difficulty in giving children a sense of ownership, because educational technology projects are typically long-term research projects. Without seeing the impact they are making, it may be difficult for the children to truly feel like design partners. One easy way to quickly overcome this challenge is to have the children on the team create both team and personal websites. The children on our team enjoyed making their own websites and felt that was an important part of their design work. Moreover, it is an easy success for the design team: the websites allow immediate feedback of design work, gives the children a sense of ownership, and building a team website gets the members of the team used to working as design partners.

4) A team needs team-building activities at the start.

There are many competing pressures when starting a new design team and it is easy to focus on getting results. Not doing enough team building the first two months of our design team reduced the effectiveness of the activities we performed. Team building may at first seem to take too much time, especially when faced with research deadlines, but the children and the adults really need to feel comfortable with each other before Cooperative Inquiry methods can work well. We have seen at UMD that hosting an intensive summer design session can work extremely well for team building. We observed that the two-week session at UMD helped prepare their new members of the team (adult and children) to become quickly acclimated to the design process. In addition, it is easier to remember people's names when you see them on consecutive days over a period of time. Weekly design sessions do not offer that same intensity for bonding and acclimation.

5) Each session needs to start with a collaborative experience.

Team building is an ongoing process. In order to develop relationships that foster creativity and working collaboratively, we have found that it is helpful to talk about our past week together. We now start our design sessions away from the computers and everybody talks and wakes more up (9am Saturday morning is early for many of our children and adults) as the rest of the team members arrive. The UMD team starts their design session with a snack, which serves to rejuvenate the team after a day of

school. Since the UBalt team meets in the morning, we provide breakfast snacks, but our collaborative experience has centered on commiserating about the early morning, talking about our respective weeks, and then gathering momentum to switch to working mode.

6) The choice of team members matters.

One question that arises when first starting a new intergenerational design team may be what kinds of people should be recruited to the team. The type of research projects available and the preferences of the people starting the team may affect this decision. In our case, the NSF grant specified that we would be working with pre-teens and that UBalt graduate students would be chosen in order to introduce them to the research process. In many cases it may be impractical to set up more specific guidelines than these, especially in the beginning, when it may be difficult to find children or graduate students suited to the work.

While it seems that the choice of children to make part of the team is irrelevant since research shows that design partnering works even with 'difficult' children [10], many research teams still systematically select the children for design partnering. Many researchers find teams by pairing with schools but for an on-going design team such as this, the time commitment is greater than a normal school partnership would allow. However, we found that to a certain degree, the choice of children does matter. It is extremely important to have children on the team who can express themselves and listen well to others. Likewise, it is important to have adults on the team who can listen and work well with children (eliminate teacher-like activities, conduct research and ask questions without being too leading, and not dominate or shy away from brainstorming activities with the children.)

7) A team needs to be interdisciplinary.

Generally, the adults on an intergenerational design team should be from various disciplines (computer science, education, art, and graphic design) and have different research interests that intersect within common research projects. In an interdisciplinary area such as educational technology, it is especially important to have different voices contributing to the project, We have learned that without as much diversity within the adults on the team, it is more challenging to pursue projects where many aspects are outside the domain of expertise of the team members.

8) Eliminate power differentials when possible.

The ultimate goal is to have a balanced team, so power differentials of all levels need to be considered and eliminated to function as an intergenerational design team. Adult-children power differences are an obvious target for focusing energies. Both adults and children need to become comfortable having non-traditional roles. However, power differentials between adult members of the team should also be considered especially in the case of faculty and students.

9) The working environment of the team needs to be conducive to collaborative design.

A physical space can greatly influence the working situation, allowing proximity to team members, while separating different groups. Businesses spend money and time to ensure environments to meet their goals, however, physical environments are not often considered for achieving educational goals [14]. The UMD team has created a kid-friendly space, open and conducive to collaborative work, both at the computers and on the floor, complete with pillows and beanbags. Our team has struggled with our physical space; it can be uncomfortable to break away from computers and sit together as a team. We were able to solve many of our problems by using an additional classroom. However, it is important to construct environments that help facilitate teamwork. Children work well sitting on the floor; physical proximity can encourage listening and respect. A "kid-friendly" room can help children feel at ease in an academic setting.

10) Children perceive group dynamics differently than adults

We discovered that the adults were very concerned about the success of the group, and most of them still did not feel that the group is succeeding as well as it could. However, we discovered during the end of semester team reflections that the children think that the team is doing well and they are proud to be a part of it. While it can be helpful (and natural!) for the adults to be concerned about how well a new group is doing, it can also be refreshing to hear feedback from the children. Their perspectives are crucial to the success of the team, and if they think that the activities are too hard, that the team needs to work more or be more serious, their ideas and concerns should be addressed. In addition, their feedback about the positive should be celebrated.

CONCLUSION

It has been shown that children pass through four roles or stages during Cooperative Inquiry research: learner, critic, inventor, and design partner [6]. In the learner stage, children are absorbing, understanding, and making sense of the process of invention. As critics, they recognize what is good and bad in other inventions. In the inventor stage, children suggest new ideas to be invented that have not necessarily been thought of in that particular way before. Finally, as design partners, children can work with others in the invention process, whether it be with adults or other children, in a collaborative way. However, as newcomers to the design team process, we discovered that not only do the children experience these stages, but adults may as well.

Starting a design team can be a daunting task, and the challenges may sometimes lead to questions about the need for working in an intergenerational team. However, despite these questions, we have seen the strengths of this process and continue to grow as a team.

We would like to conclude with a final lesson learned from our design team experience: **Starting a new design team takes time!** We know we need to celebrate the successes as they come and learn from mistakes, but recognize the process is not instantaneous and that the building process is often slow and challenging.

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