Chinese Preschoolers as Design Partners – Lessons Learned

Jinping Liu
HappyOrNot Ltd
Vuolteenkatu 20, Tampere, Finland
and
Aalto University, School of Arts, Design and Architecture
Hämeentie 135C, Helsinki, Finland
inping.liu@gmail.com

Virpi Roto
Aalto University, School of Arts, Design and Architecture
Hämeentie 135C, Helsinki, Finland
virpi.roto@aalto.fi

CHI'17 Extended Abstracts, May 06 - 11, 2017, Denver, CO, USA

ACM 978-1-4503-4656-6/17/05…$15.00
DOI: http://dx.doi.org/10.1145/3027063.3053343

Abstract
Participatory design (PD) with preschoolers is an emerging and challenging research topic. This paper reports findings from a series of PD activities with children aged 4-6 years in China. China is an interesting culture for PD, and there is a hole in PD research with Chinese children of this age group. PD sessions were found challenging to conduct in this context, but techniques such as using a familiar comic character as a metaphor, the facilitator as the drawer, and one-on-one communication in a group setting seemed to alleviate the difficulties. Based on the case study findings, the pros and cons of each tested technique in designing child-computer interaction are discussed.

Author Keywords
Child-Computer Interaction, Participatory Design, Case Study

ACM Classification Keywords
H.5.2 User Interfaces; User-centered design

Introduction
The collaboration partners of participatory design (PD) have been expanding from adults to children. An increasing number of designers are aware of the importance of children not only in offering feedback on

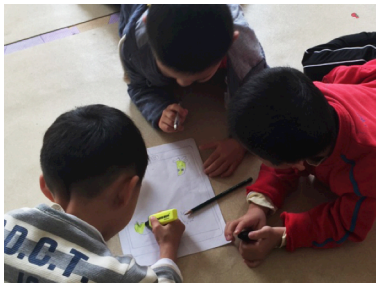

Figure 1: Children in the same group worked individually on the same piece of paper.

Figure 2: The final outcomes were barely unrelated imaginary scenes.

the design results, but being informants or even contributors in the design process itself. However, researchers' experiences of PD activities with preschoolers seem to differ. Earlier research has shown that children aged 4-6 years are challenged by "truly collaborating and elaborating on one another's ideas" [9]. Similar findings were raised on preschoolers' difficulty in collaboration even after months of collaborative storytelling activities for the design of shared interfaces [2]. Young children with disabilities have been reported to face difficulties in sufficiently expressing their ideas and narratives in PD activities using toolkits and comics [7]. Thinking of ideas was also listed among the most difficult things in the early design phase by the young design partners in [6]

A more neutral tone was found in a three-year-long design project for storytelling technology. The project utilized a co-operative inquiry method (adapted from [1]), which consisted of three main types of session activities: educational, evaluation and brainstorming. The obstacles of the young children as design partners were nevertheless more related to school context and concept implementations [11]. Likewise, several studies have reported relatively positive research outcomes from PD with preschoolers [8,5,3]. Guha et al. [8] report techniques to facilitate young children to build upon each other's ideas by mixing ideas for multiple rounds. In [5], a series of participatory spatial planning activities was successfully conducted with young children to create an ideal city for children. The storyboarding technique used in [3] proved its merits in allowing young children to generate emotional narratives for the design of a coloring book.

This case study approached PD with preschool-aged children in China. The practical aim was to serve the design of a mobile game to help preschoolers to learn Chinese characters in an engaging manner. The objective of the PD sessions was not to gain the functional needs of the game but rather the children's perception and values in gaming and learning experience in order to enrich the game's narrative and form. The research aim was to find successful techniques for this purpose in the given context. The researcher had conducted observational research in a kindergarten, but had previous experience of PD with adults only. In 2015, she arranged 3 consecutive PD studies in a coastal city called Huizhou in China and adjusted the techniques in each study to improve the means of facilitating design ideation.

China is an interesting context to study PD methods with preschool-aged children. The recent one-child policy in China has led to a competitive setup and examination culture [4], which seems to reach younger and younger children. Children aged from 4 to 6 are required to learn subjects such as mathematics, literature, and English. Despite education reform activities [4], rote learning is still common in preschools. This may influence the attitudes and creativity of children attending PD sessions.

We have been unable to find studies addressing PD with preschoolers in the Chinese context, although one study did involve Chinese schoolchildren aged 7-11 in testing three variant PD methods [10]. Neither have we found studies reporting lessons learned from a series of PD sessions with Chinese preschoolers. The results shed light on the pros and cons of several techniques that were found useful in this context.

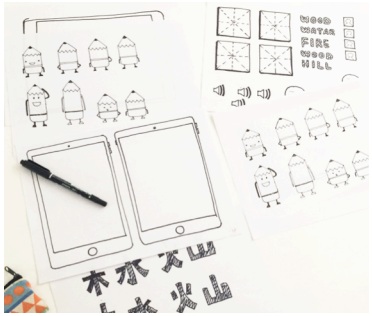

Figure 3: Interface widgets prepared for the second PD workshop.

Figure 4: Some of the children's drawings in the second PD workshop

Figure 5: Pre-made comic panels in the third PD workshop

Participatory Design Sessions

Three PD sessions were conducted in an iterative manner during a two-month period. Each session was a methodological learning experience, and different techniques were used to facilitate ideation.

The First Session

The first PD workshop was conducted with 7 Chinese children aged from 4 to 5 years old. A kindergarten with over 200 children was set as the place to hold the workshop. With the permission of the principal, 3 boys and 4 girls were selected by the teacher from a class based on their active daily performance. The workshop structure was planned according to general guidance for PD sessions: a warm-up phase followed by an actual PD activity. The warming up phase lasted for around 10 minutes, in which each child was encouraged to share their experience of playing mobile games. In the following 20 minutes, the children were divided into two groups by gender for PD activities. A task asking for a mobile game design for learning Chinese was given in a plain manner with ready-made paper mockups of iPad and other tools including color pens and scissors.

The children's performance in the first PD workshop failed to reach the initial expectation. First, instead of ideating together, the children were merely drawing their own drawing on the same paper mockup (Figure 1). Second, none of the children were tackling the given design tasks but drawing their unrelated imaginary scenes (Figure 2).

The Second Session

The second PD workshop was conducted with another 2 girls and 4 boys aged 4 to 5 in a daycare center, which features Montessori education. Three methodological changes were made in the second PD workshop. First, group work was canceled and the children were asked to figure out their own solution to the design task individually. Second, an invented cartoon character who is bothered by learning the Chinese language was introduced and then the design task was to draw a digital tool to help the character. Third, the toolkit included various ready-made interface widgets and a cartoon character was provided for facilitating children's drawing (Figure 3).

Unfortunately, the above changes did not benefit the outcome of the second PD workshop. Again, instead of building prototypes by using the provided interface widgets, the 6 children were drawing irrelevant imaginary scenes on the given paper mockup (Figure 4).

The Third Session

The third workshop was conducted in the kindergarten where the first PD session was conducted and two significant changes were done in the PD approach. First, the age group of the participants was switched from 4-5 years old to 5-6 years old and the number of children invited to the workshop was almost doubled to 10, split into two groups of 5 children by gender. Second, the comicboarding method [10] was adopted as the main approach to organizing the workshop.

At the beginning, a reinvented story of a renowned Japanese comic "Doraemon" was told. The story depicts a scenario, in which the male character Nobita asks Doraemon to help his Chinese learning with a futuristic tool. Next, pre-made comic panels were showed with two blank panels (Figure 5). Each child was asked to tell their own ideas of the futuristic tools one by one and the facilitator (the first author) promised to draw

them out on the blank panels. While the facilitator was drawing, each child was asked to share the reasons behind the particular idea.

The outcomes of the third workshop showed a significant improvement to the previous two workshops. First, the number of relevant ideas was dramatically increased. All the participants were able to come up with at least one relevant idea to the mobile game. Second, the young participants showed their enthusiasm by rushing to the facilitator with their ideas. (Figure 6).

Figure 6: The facilitator was surrounded by children eagerly waiting to share their ideas.

Lessons Learned from the PD sessions

The three PD sessions provided us the hands-on experience of conducting PD methods with Chinese preschoolers in a design project for digital games. The iterative methodology improvement process offers us a unique lens for analyzing the effective and less effective practices for PD sessions with Chinese preschoolers.

Less effective techniques:

- Plain Design Tasks

  Introducing the design task in a plain manner failed to render it understandable to children. In the first PD session, the design task was introduced in a plain way. The facilitator was expecting the children to use paper, color pens, scissors and glue to generate whatever imagination that they have regarding the given task. However, none of the 6 participants was able to create a relevant solution. Although only one participant's final concept was a mobile game helping to dress up a virtual little girl, it is still far from being relevant.

- Design Task in an Invented Story

  A newly invented story was not able to clarify the design task to the children either. In the second session, although the invented character seemed to attract the children's attention better than the plain design task initially, the 6 participants were only able to use the character to create unrelated new stories or draw other objects instead of tackling the given task. This finding, however, is at odd with the earlier research done in [3], in which unfamiliar character successfully facilitated children's ideation process.

- Interface Widgets

  The interface element probes added no value to reminding the participants of the design task. In the second session particularly, the children were exposed to a set of interface elements including Chinese characters, volume icons, arrow buttons and user icons. (Figure 3) Although these probes were placed in the center of the table, the children were just not aware of their existences and continued finalizing their own drawing.

- Group Work

  The collaboration among the informants might be the most effective way to provoke creativity in most PD activities. However, it seemed that collaboration among young children is difficult to trigger. Although the 6 children were divided by gender into two groups in the first PD session, the children were still working independently by drawing their own picture on a shared paper with their teammates (Figure 1). Despite the author's reminding of teamwork, the children were still grabbing pens from each other in order to continue their own drawing. Such

phenomenon is not unique given the earlier research on the similar topic. [9,2]

- Requiring children to draw independently

  Another phenomenon founded in both the first and second PD sessions was the children's frustration regarding their inability to draw. When the design task was given, the instant reaction of more than 4 children was saying that they do not know how to draw and seem to be quite upset of the task, and the teachers further explained that children at this age didn't learn too much drawing in class. In contrast, when the children were only asked to tell their imagination and the actual drawing would be finished by the researcher, their enthusiasm regarding the design task increased significantly. This finding is aligned with what is described in [10].

More effective techniques:

- Drawing by the Facilitator

  The reducing burden of drawing not only coincided with their enthusiasm to the task but also with the improvement in both quantity and quality of their outcomes. In the third session, all the 10 children were able to generate relevant design solutions and 7 solutions among them were described with fine details and functionalities. Many of the children were amazed by the fact that their imagination can be realized. As a result, some children even asked the facilitator to draw more than one drawing for them.

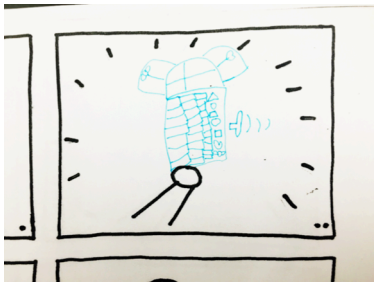

Figure 7: A girl drew an audible bookshelf which can fly.

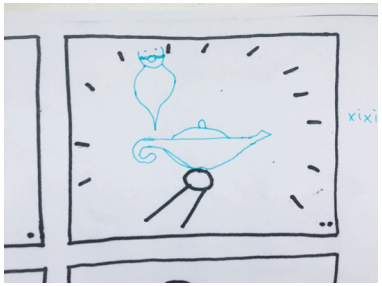

Figure 8: A boy asked the facilitator to draw the genie in the bottle.

Having the researcher as the person who draws brought about two advantages. First, the natural conversations regarding the details of imagination between the researcher and children would allow the researcher to deeply understand how and in which scenarios the imaginary tools would work. Such information would better inform later design decisions than the pure drawings. Second, keeping the research aim in mind, researchers would be able to notice the irrelevant ideas immediately and encourage the young participants to think again. In this way, the chance of collecting unrelated ideas was largely reduced.

- A Familiar Comic Character

  Unlike the invented story offered in the second session, the well-known Japanese comic character used in the third session seemed to trigger children's creativity. Since "Doraemon" is renowned for its pocket full of futuristic gadgets in helping the male character in all kinds of scenarios, it naturally provoked the children's creative thinking. However, it is also worth to mention that many of the ideas generated in the unique context resemble the features of known Doraemon's gadgets. For example, some of the gadgets the children came up with can fly (figure 7), and some of the gadgets would help magically without the learner making any effort (figure 8).

- One-on-one Communication

  In contrast to grouping the children, facilitating the children's ideation through individual communications showed more effectiveness in idea generation. The results of the third PD session are

similar to the results found in [10]: when the children were asked to tell their own story one by one, the individual's idea was fully expressed due to the facilitator's constant asking. Also, the communication regarding children's reasoning of detailed design decisions will help the researchers understand the thinking process of each idea.

- Children Hearing Each Other's ideas

  Allowing children to hear each other's ideas during their one-on-one communication with the facilitator was a main methodological variance of the comicboarding technique in the third PD session. Unlike the failed group work in the first workshop, the children in the third workshop paid more attention when other children were articulating their imagination. Some children were even able to point out the problems when their peers raised something unrelated. Besides, there was a clear interrelation among their ideas. For example, two children came up with caligraphic copybook ideas and the other two raised similar concepts about alphabetic learning tools. Collaborating in this unique manner brings children the opportunity of being inspired by others' ideas but still enables them to fully express their own thoughts in a structured way.

Discussion

In this chapter, we report a cross-case analysis of the three PD sessions.

Constrained vs Open-ended

The Chinese examination culture emphasizing attention to detail might affect preschoolers' ability to act on open-ended tasks. Indeed, the first workshop with an open-ended task turned out to be very difficult in this context. We cannot conclude, however, whether this was an age- or culture-specific problem.

PD methods such as storyboarding [3] introduce constraints to children's ideation. Our third workshop used comicboarding with a more constrained task. On one hand, this boosted the children's productivity and enthusiasm, compared to the open-ended design assignment in the first workshop and less unbound second workshop. On the other hand, the children's imagination was somewhat restricted by the comic character. Although children in the third workshop produced multiple pertinent solutions to the design tasks, many of them were clearly elaborating on the well-known features of the comic character's gadgets. Therefore, it is hard to find the right balance between constrained and open-ended PD task.

Children's Age Ranges

Children's age range significantly influenced their ability to draw abstract concepts, which was the decisive factor of their performance in the workshops. The most common objects in the drawing of the first two workshops were the children themselves and their parents (Figure 2 and 4). None of the drawings in the first two workshops was able to explain a relevant concept or object. According to the later interview with the teachers, children aged from 4-5 are lacking drawing skills comparing to their older counterparts. Such a limited ability to visualize unfamiliar concepts could prevent them from freely expressing their thoughts through drawing. However, it is worth to note that such inability could be due to the power distance between adult and children in China's unique context where adults normally do not empower young children to solve problems on their own. In such context, the

Montessori approach did not seem to ameliorate the situation.

Conclusion

We reported a series of three PD sessions aimed at collecting child-computer interaction design ideas from Chineses children aged 4-6 years. The research aim was to identify techniques that empower preschoolers as design partners. The most promising technique to work with the preschoolers turned out to be the comicboarding approach in the third workshop: having the facilitator interview children in a one-on-one manner and draw the raised ideas at the same time. This was combined with a familiar cartoon character for whom the children were asked to design for. We made two changes to the comicboarding method compared to [10]. First, the comicboarding method was applied with school-age children whereas in this research it was applied with preschoolers. The method seems to work also with children aged 5-6 years. Second, the comicboarding method in [10] was applied with each child individually whereas in this research the children were allowed to listen to each other's ideas. This triggered the children to reflect on others' ideas. The number of children in the session was probably at the upper limit, so we recommend smaller groups for comicboarding PD sessions.

Previous studies reporting PD activities in this context seem to be non-existent, perhaps due to the teacher-oriented rote learning culture that does not often empower children as design partners. However, although one of our PD sessions was conducted in a Montessori kindergarten, it did not affect the PD success much. Thus, despite the challenging-sounding Chinese context, the results are probably more dependent on the suitability of the techniques to the children's psychological development phase than on the Chinese preschool culture. Therefore, our findings may be valid also outside Chinese context. Any further research on the suitability of the new techniques for empowering preschoolers as design partners in other cultures are welcome.

Acknowledgements

Thanks to all the children and adult informants who shared their valuable perceptions and vivid life stories.

References

1. Alborzi, H., Druin, A., Montemayor, J., Platner, M., Porteous, J., Sherman, L., ... & Kruskal, A. (2000, August). Designing StoryRooms: interactive storytelling spaces for children. In Proceedings of the 3rd conference on Designing interactive systems: processes, practices, methods, and techniques (pp. 95-104). ACM.Benford, S.,

2. Bederson, B. B., Åkesson, K. P., Bayon, V., Druin, A., Hansson, P., ... & Simsarian, K. T. (2000, April). Designing storytelling technologies to encouraging collaboration between young children. In Proceedings of the SIGCHI conference on Human Factors in Computing Systems (pp. 556-563). ACM.

3. Chung, H., & Gerber, E. (2010, October). Emotional Storyboarding: A participatory method for emotional designing for children. In Proceedings from the 7th International Conference on Design & Emotion.

4. Dello-Iacovo, B. (2009). Curriculum reform and 'quality education' in China: An overview.

International Journal of Educational Development, *29*(3), 241-249.

5. Ergler, C., Smith, K., Kotsanas, C., & Hutchinson, C. (2015). What Makes a Good City in Pre-schoolers' Eyes? Findings from Participatory Planning Projects in Australia and New Zealand. Journal of Urban Design, 20(4), 461-478.

6. Farber, A., Druin, A., Chipman, G., Julian, D., & Somashekher, S. (2002, January). How Young Can Our Technology Design Partners Be?. In PDC (pp. 272-277).

7. Frauenberger, C., Good, J., & Keay-Bright, W. (2011). Designing technology for children with special needs: bridging perspectives through participatory design. CoDesign, 7(1), 1-28.

8. Guha, M. L., Druin, A., Chipman, G., Fails, J. A., Simms, S., & Farber, A. (2004, June). Mixing ideas: a new technique for working with young children as design partners. In Proceedings of the 2004 conference on Interaction design and children: building a community (pp. 35-42). ACM.

9. Guha, M. L., Druin, A., Chipman, G., Fails, J. A., Simms, S., & Farber, A. (2005). Working with young children as technology design partners. Communications of the ACM, 48(1), 39-42.

10. Moraveji, N., Li, J., Ding, J., O'Kelley, P., & Woolf, S. (2007, April). Comicboarding: using comics as proxies for participatory design with children. In Proceedings of the SIGCHI conference on Human factors in computing systems (pp. 1371-1374). ACM.

11. Taxén, G., Druin, A., Fast, C., & Kjellin, M. (2001). KidStory: A technology design partnership with children. Behaviour & Information Technology, 20(2), 119-125.