Hero: Designing Learning Tools to Increase Parental Involvement in Elementary Education in China

Abstract
In this paper, we present the design of Hero, a suite of learning tools that combine teacher-created extracurricular challenges with in-class motivational tools to help parents become more involved in their child’s education, while also engaging students in their own learning. To inform the design, we conducted field studies and interviews involving 7 primary teachers and 15 different families. We analyzed Chinese parenting styles and problems related to parental involvement, and developed three major themes from the data. We then proposed three design goals and created a high-fidelity prototype after several iterations of user testing. A preliminary evaluation showed that teachers, parents, and students could all benefit from the design.

Author Keywords
Elementary education; parental involvement; educational design

ACM Classification Keywords
H.5.2 [Information interfaces and presentation]: User Interfaces
Introduction

Research shows that the quality of parental involvement in child and adolescent education impacts children’s school success [2, 3]. Several technologies to increase parental involvement have been developed for Western cultures. Some of this research focuses on improving parent-child communication, such as the Whereabouts Clock [1] that helps family members become more aware of each other’s activities and locations. Another project, ShareTable [11], supports remote and synchronous parent-child communication. Other projects have focused on supporting knowledge exchange between home and school, such as the HSKE (Home–School Knowledge Exchange) project [5], adopting videos to show parents their children’s school activities and asking children to bring aspects of their out-of-class lives into classroom.

However, the context of education in China is very different from that of Western countries due to different social, economic, and cultural conditions. Currently, over 90% of students in urban areas are only children [9, 10] as the result of the one-child policy, causing parents to have very high expectations for their child’s achievement [4]. Students in China often focus mostly on textbook knowledge and rote learning due to the exam-oriented educational culture and fierce competition in society [8]. These characteristics result in a different kind of parental involvement in student learning processes, and may also cause different problems.

Currently, few educational systems consider the characteristics of non-Western contexts like China. We worked to design a system that would promote Chinese parents’ involvement in their child’s primary education.

We chose primary education because during this time, the impact of parental involvement is greater than that of school quality [2].

We conducted field studies with elementary school students, parents, and teachers to understand the educational context of China, which then informed the design of a suite of learning tools called Hero. Hero provides three different client applications (Figure 1): a website for teachers, a mobile application for parents, and an interactive adventure map that can be used in the classroom by each student. These three parts interact with each other, guiding parental involvement with teacher-created challenges and bringing out-of-school learning achievements back into the classroom to increase the effect of at-home education on students’ school performance. This work will describe the field study, as well as the design of our system.

Findings from Field Study

We spent 2 months conducting the field study, including interviews and usability testing, at an elementary school in Beijing, China. Our participants included: 7 teachers (4 head teachers and 3 specialized teachers), 15 parents from 15 different families, and their 15 only children (age range from 7 to 10). As social class has a powerful influence on parental involvement patterns [7], we choose an equal number of parents from different social classes (high, middle, and lower class, as reported by the participants) to counterbalance the impact of this factor. All the parents (4 males and 11 females) we chose played the primary role in parenting their child. The remainder of this section will discuss our findings about parental involvement in China.
Limited parent-child communication
When we asked parents about their involvement in their child’s education, they complained about the limited time they had for parenting because their children were taking many extracurricular “cram sessions” in subjects like math and Chinese. According to our interviews, 5 of the student interviewees attend 2 “cram sessions”, while the other students attend more. Little time is left for parent-child communication that is important to the development and wellbeing of a child [6]. We interviewed our participants about their attitudes towards the cram sessions. We also audited a math class at a primary school and extracurricular math cram sessions.

Our interviews pointed to **Social influence** as the main reason why parents sent their child to extracurricular cram school. Most parents send their child the cram school simply because other parents do. They could not tell whether these cram sessions could really help promoting their child’s school performance. These sessions impose heavy burdens on the students. 11 of our student interviewees said they felt even more tired at weekends because they had to attend several extra cram sessions in addition to finishing the homework.

We also found that **Repetitive knowledge** was taught at cram schools. When we audited one math cram session in Beijing, we found that the knowledge taught there was nearly the same as the classroom instruction. Most of the time is spent taking repetitive exercises, which could also be completed at home. Teachers at regular schools indicated that the students could get good scores at school without attending any cram sessions if they previewed and reviewed the knowledge in the way that the teacher asked them to.

Lack of knowledge of pedagogy
The involvement of our parent interviewees in their child’s education was mainly limited to the following aspects: 1) supervising their child as they finish homework; 2) checking the accuracy of homework; 3) finding their child’s learning weaknesses according to their exam scores; and 4) asking the child to take action towards improving the weak points. When their child gets a low score, they do not know what causes this weakness or how to help improve it. We recognized that the parents’ current methods of involvement are singular and simple, and better pedagogies are needed.

Our teacher interviewees reported that parental involvement with proper pedagogy would benefit students significantly. One teacher participant explained: “Parents are the people who know their children best. If they could be involved in education with correct pedagogy according to their children’s characteristics, children would make a lot of progress.”

Parents’ high trust in teachers
All of our parent interviewees described having a high respect for teachers, especially the head teacher. Parents also reported that they would like to learn teaching techniques from the teacher to help with the child’s school learning. One story told by a parent brought us a lot of inspiration in our design: "My son was not good at Chinese, especially composition writing. I asked the teacher for some advice and the teacher said I should ask my child to read more excellent examples in the composition books and then imitate them. I did as the teacher said and my son really made great progress in his composition. So I thought there was no need to sign him up for Chinese cram session.”
We found that parents had higher trust in the child’s teacher from regular school than the one from cram school. The teacher’s advice helped improve parents’ pedagogy skills, and also helped them understand which cram sessions were redundant.

**From Field to Design**

From the field study, we developed several design goals to promote reasonable, effective parental involvement in elementary education in China:

- Increase parent-child communication by reducing redundant cram sessions.
- Improve parents’ pedagogy skills to increase their ability to teach their children.
- Involve teachers’ guidance in parenting to leverage the trust parents have in them.

Figure 2 shows the current Chinese educational relationships we summarized from the field study and our design goals outlined above.

**Prototype description: Hero**

Considering our findings from the field study, we designed Hero, a system that 1) provides Chinese parents with teacher guidance to improve their pedagogy skills, and 2) saves more time for parent-child communication by reducing redundant cram sessions. Hero provides three different client applications (Figure 1): a website for teachers to give educational guidance in the form of challenges and track the students’ at-home education progress, a mobile application for parents to complete the teacher-created challenges with their children anywhere outside of class, and an interactive adventure map used in the classroom by each student to evaluate their out-side-of-school and in-class achievements. The website and mobile application were created with HTML prototyping software called Justinmind, and the interactive adventure map was implemented with Javascript, JQuery Mobile, and HTML5 that was deployed on an iPad2 tablet.

A website is designed to provide teachers with a platform to give parents advice and guidance. The guidance is created in the form of challenges, such as asking parents to read a specific book with their child, or visit a museum. We believe that challenge-based guidance will be more clear and specific for parents, make it easier for teachers to track progress, and be engaging for parents and children. The challenges are created according to different educational problems, but not specific to any particular child. Our system separates challenges into different subjects (Figure 3a); each challenge is labeled by what kind of benefit it might have so parents can select suitable challenges. The challenge progress is updated synchronously on the website to inform teachers of students’ educational activities outside of school (Figure 3b). We choose a website as the teachers’ interactive platform due to its high accessibility that allows teachers to edit challenges and track the challenge progress in various situations.

A mobile application is provided for parents to help them search for different kinds of educational challenges, and accept the tasks that suit their child’s needs. Each challenge has several sub-tasks such as taking a picture, writing comments, or answering questions to give parents step-by-step guidance in finishing a challenge with their child (Figure 4). These sub-tasks take advantage of the technologies commonly included in mobile phones, such as photo...
and video tools, or location services, allowing parents and students to turn the world outside of the classroom into a place for in-context learning. Our system also records the progress of each challenge and reminds parents to finish the challenges. This platform is chosen for its portability allowing parents and children complete the challenges anywhere outside of school.

An interactive adventure map is designed for students. The adventure map runs on a ‘smart desk’ or tablet (e.g. Microsoft Surface, or an Apple iPad) that each student will have, motivating them with virtual rewards for their out-of-class and in-class achievements. We choose the mid-size touch screen devices because they are both suitable to display an adventure map and easy to be manipulated by a child. There are several main islands that present different learning subjects on the map (Figure 5a). On each island, there are tests and assignments for students to complete in class. Teachers can upload tests and assignments to the map and get statistical analyses of student performance on their website. Extracurricular challenges completed with parents are shown on the map as new, smaller islands. According to how many out-of-class challenges and in-class achievements students have completed, the student will get corresponding points that they can use to buy decorations in the virtual store (Figure 5b) to decorate their map. Students will have their own adventure map to show their own characteristics and achievements.

Preliminary User Test
We conducted a usability study of our system for 2 weeks with the same participants from our field study (7 teachers, 15 parents from different families, and their 15 only children). During the user test, we presented our system and tested the prototype by asking participants to conduct various tasks with our prototype: 1) Teachers create a challenge and check challenge progress, 2) Parents accept a challenge and complete it with their child, and 3) Students finish a test on the interactive map and buy decorations in the virtual store. We observed the participants as they interacted with the prototype, gathered feedback, and discussed possible improvements with them.

Positive feedback
Our system is easy to understand and use according the participants’ subjective feedback. The discussion revealed several aspects that participants enjoyed:

- All the parent participants agreed that they could get pedagogical guidance from teachers through our system. 11 participants indicated that if the challenges could improve their child’s achievement at school, they would sign them up for fewer cram sessions.
- 5 of 7 teacher participants reported that providing parents with guidance would be helpful and they would like to create challenges for parents if they had enough time. All of the teachers agreed that the system could help them better understand what students were doing outside of school academically.
- All of the students showed great interest in the adventure map and said they would like to complete teacher-created challenges with parents.

Areas for improvement
The discussions also revealed several aspects that participants were concerned about:

- Some parents indicated it should be easier for them to find challenges that fit their child’s needs. To solve
this problem, we are thinking about providing a challenge recommendation mechanism that chooses suitable challenges for parents according to their child’s in-class performance that is recorded in our system.

- Creating challenges for parents may present teachers with a heavy burden. One solution could be supporting parent-created challenges as well, among which teachers could choose ones that would be most likely to help students.
- The degree to which challenges can promote the student’s learning is the most vital issue. We need to conduct a long-term user test to evaluate the effect of challenge-based learning on school performance.

**Conclusion and Future Work**

In this paper, we presented findings from a field study of elementary education in China, and summarized design issues related to parental involvement. We also presented Hero, a suite of learning tools that aim to 1) increase Chinese parental involvement by providing parents with teacher-created challenges to improve their pedagogy skills, and 2) increase parent-child communication by reducing redundant cram sessions. In the future, we plan to improve our system according to the results of our preliminary user test. We will also implement a more robust version of the system, and conduct long-term evaluation with more participants to measure the feasibility and sustainability of our system.

**Acknowledgements**

We thank our participants, staff and students from World Lab, and our anonymous reviewers.

**References**


