The issue of education for migrant children has become highlighted in urbanized transformation of Shanghai. The difficulties reflect on the following aspects: the part of education for migrant children is counted out of public educational system; when growing up, migrant children have to come back to their original hometowns to attend the matriculation test in which the contents are distinguishing from what they’ve learned in Shanghai; because of migration, it is difficult for this group of children to be engaged into social life of Shanghai. Hence new methods of the education for migrant children are supposed to be considered. This research aimed at cultivating migrant children’s design thinking through methods of service design, which involved D-STEAM, holistic view and stakeholders. The design process and four design prototypes are presented in this paper. After testing, the prototypes obtained positive comments but also suggestions for improvement, which demonstrated that service design is an effective way to improve the quality of preschool education for migrant children in kindergarten of Shanghai.

service design, migrant children, preschool education, educational transformation

1 Introduction
Since 1980s, a huge amount of rural labors population swarmed into big cities like Beijing, Shanghai and Guangzhou, which led to tremendous changes in population structure and educational requirements. The number of migrant children moving to cities with their parents increased gradually during recent years, from 81.3 thousand in 2008 to 199.3 thousand in 2012 (Lu, 2013). The problems that include different education government policy, lack of teaching resources and teachers hinder the development of preschool education for migrant children.

The project team, comprised by research team in Tongji University, the United Way and Yang Design, tried to improve educational service for migrant children in Shanghai through co-operation and co-design among children, parents, teachers, educational institutions and social organizations.
1.1 The situation of education for migrant children in kindergarten

1.1.1 Government policies
As one of the cities that put attention on preschool problems of migrant children, Shanghai government published Advice of The Preschool Education Work for Shanghai Migrant Children (Shanghai Municipal Education Commission, 2008), which emphasized standard management to the private kindergartens mainly for migrant children. By 2014, migrant children, with the amount more than 210.9 thousand, occupied 41.94% of the registered children in kindergarten.

1.1.2 School and teaching resources
The group of migrant children has a high mobility and generally low education background, and the proportion of their school attendance is always in fluctuation. They mainly enter into private kindergartens or nurseries, most of which were rebuilt from old factories or dwellings and had many problems in space and equipment. In addition, the instability of teacher employment intensifies the pressure on those kindergartens.

1.1.3 Domestic education
About 75% migrant labour in Shanghai gained education no further than junior school. 93.6% migrant families rent flats in suburban area with much lower cost or even sheds, tenement houses, which place children’s learning and entertainment in a terribly disturbed environment. Besides, the parents are not able to have enough time and energy to stay with their kids, because migrant labours usually are employed in jobs with intensive physical input, which result in the near vacancy of domestic education part. Meanwhile, the communications between are also in a low frequency.

1.1.4 Social organization
Under the rise of public educational requirements, educational charities in Shanghai that focused on emotional care for “left-behind” children, social integration of migrant children and preschool education increased from 150 in 2009 to more than 300 in 2013. Resources donation, voluntary teaching and public welfare projects are still the main services that social organizations offer.

2 Research background

2.1 Service design and educational transformation
Service Design methodology has been adopted in the education model transformation, to use it as the human-centered design process considering “a deep understanding and respect for human behaviors, attitudes, dreams and capacities as the essential premise for any design action.” (Meroni and Sangiorgi, 2011). In the past years, service design started to play more and more significant roles in innovation of education. IDEO, a leading design consultancy, who has engaged in couple of educational innovation projects. The Gatópolis, a digital game and diagnostic tool designed by IDEO that teaches reading through games and helps teachers address learning gaps. K12 studio in Stanford has dedicated to the research on design thinking in courses of junior and primary school to improve students’ creativities; the trial of “Phenomenon Method”, started form 2013 in Helsinki, Finland, rejecting traditional infusion education, concentrated on cultivating initiative learning ability.

2.2 Social innovation stimulated by service design
Types of design connected to social innovation as follows: polity design, organizing design, service design and role design (Whiteley, 1993). It has been proved through the emergence and practice of service design that it is the co-operation not the control by certain classes that brighten the values of design (Wang, 2017). As a consulting institution for the government, Design Council in the U.K. used service design as a strategic measure to meet arduous challenges in society and stimulate the economy. The Social Design Department in Applied Art University Vienna made plenty efforts to solve social problems in public space, urban transportation, refugee employment and multi-cultural integration by art methods.
2.3 **Preschool education and social innovation**

The relationship between social innovation and education is important but intricate. On the one hand, social innovation plays a necessary role in educational transformation. On the other hand, education itself is a way to build awareness of social innovation and cultivate social designers. The connections between schools and society in improving human and social development were mentioned in The School and Society: Being Three Lectures (John, 1899). The development of preschool education can be influenced and restricted by diverse social elements while it can help the positive development of society. Esping Andersen proposed “a child-centred social investment strategy” (Esping, 2002). Hemerijck extended the impact of relationship between preschool education and society to fields of women employment, lifelong study and social competition (Hemerijck, 2009).

3 **Research Methods and Analysis**

This project lasted one year (from Dec. 2016 to Dec. 2017), operated by Tongji University, the United Way, Yang Design, Shanghai Charity Foundation and Minhang District Education Bureau. The team did research in Huaning Road kindergarten and Shiji kindergarten, and chose Shiji kindergarten to test the 4 prototypes.

Case study is the first research method we used. The research process was driven by design practices, thus useful tools and methods (questionnaires, customer journey, stakeholder map, etc.) could be selected through case studies. Inspired by the western methods in field research we used this time were adjusted to the specifics of our users. Questionnaire was employed to capture the understanding and demanding of parents and teachers. Participants were asked by questions about their living situation and attitudes toward the preschool education. For children, the team organized a service design workshop instead to observe children’s behaviours by playing games with them, painting together and telling stories. It was proved that cocreation with children is an effective tool for making research among them. SERVQUAL was set for parents to make comparing assessment about expectation and situation about kindergarten service.

3.1 **Case Studies**

My Dream World project, directed by professor Satu Miettinen of University of Lapland, aims to increase the involvement and inclusion of young people in Namibia and South Africa using innovative service design tools. The project helped community organizations to find innovative even radical solutions to the essential services for the young people (education, health) together with their customer, young people. “Where’s Daryl?” Project, is an anti-gun violence educational toolkit, designed by Designmatters at Art Centre College of Design. It asks youth to consider their assumptions about guns and discuss the real negative impacts they can have on their lives and goals.

Mission Lab, a design studio embedded in the school and staffed by game designers and learning specialists. They design a new education system for a public school operating within the context of the US Department of Education (DOE). In this new system, teachers developed new identities as teacher-designers (Katie, 2017).

3.2 **Field Research**

According to the research of National Research Council in USA, the learning gap of children in needy or vulnerable families appears during the first 5-year in their life. In December 2016, the research team visited two private kindergartens on third level in Minhang District of Shanghai. 5 service design workshops worked as field research were organized with some research work involving questionnaires and deep interviews and co-creation with children. There were more than 30 interviewees contained children, parents, teachers, and leaders of kindergartens. To get knowledge of the real requirements of stakeholders, the team observed teaching scenes on class, visited the school facilities, played games with the children there, and talked with parents and teachers. We prepared cameras, recording pens and questionnaires to collect data and information. To break the
ice, the team members made portraits for some kids and sent the works to them to attract their interests. After that, the team invited children to paint together under a theme of “What is your teacher/school like?” to see children’s impression on their teachers and school. Some common toys, like building blocks, were used in games and co-creation stage as well to know of what kinds of toy shapes or game forms the children prefer to. Except visiting the campus environment by the team themselves, children were encouraged to guide them hanging around to explore hidden problems in facility using and daily activities. When talking with children during painting and games, it was also a chance to gain some basic information from them and acquire their abilities of communication, emotion control and expression. As for teaching activities, the research team joined in some lessons to observe and record interaction of teaching and learning. Several team members even tried to experience the role of teacher to consider the service process empathetically.

A service quality examination system of SERVQUAL was used to test the present educational service and investigate the way to improve service quality as well as promote the relationship between the school and the parents. The SERVQUAL (service quality framework) was used widely as a basis for evaluating the service quality of existing feedback systems and investigating the outcome of the service design from the user perspective. SERVQUAL provides a basis for many quality measurement models/tools, the framework comprises five service dimensions (Zelthaml, 1990):

1. TANGIBLES—Appearance of physical facilities, equipment, personnel, information transparency and communication materials
2. RELIABILITY—Ability to achieve service promise supports for parents/children, high-quality service and emergency measure.
3. RESPONSIVENESS—Working information update, timely response to parents/children’s asks and timely service with enthusiasm.
4. ASSURANCE—Ability to convey trust and confidence to parents/children, politeness and ability to solve problems from parents/children.
5. EMPATHY—Individualized consideration, enough service time for all parents/children, awareness of special requirements and parents'/children’s profits.

From the result of SERVQUAL Test, the team could know parents’ expectation and satisfaction on school service, like teaching contents and quality, and which aspects of children they focus more on, diets, acquired knowledge, grades, physical and mental development. In addition, using and analysing methods of Rorschach Test was quoted to help the team know children’s psychological situation. However, the results did not have enough value for design process: all of the choices of satisfaction they marked were at the highest level and made no negative comments, which might result from that they were designated by the kindergarten.
Table 1 A table outlining the methods used, the participants, the duration, the data collection methods in the service design workshop.

<table>
<thead>
<tr>
<th>Contents</th>
<th>Methods</th>
<th>Number</th>
<th>Data collection methods</th>
<th>Lasting time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Service design workshop with children</td>
<td>Painting with children</td>
<td>20</td>
<td>4 cameras for video and photo</td>
<td>1 hour</td>
</tr>
<tr>
<td>2. Service design workshop with children</td>
<td>Playing games with children</td>
<td>30</td>
<td>4 cameras for video and photo</td>
<td>1 hour</td>
</tr>
<tr>
<td>3. Service design workshop with children and teachers</td>
<td>Observation and interview with children and teachers</td>
<td>35</td>
<td>2 cameras for video and photo; 2 recording pens</td>
<td>2 hours</td>
</tr>
<tr>
<td>4. Service design workshop with parents</td>
<td>Interview with parents and SERVQUAL Test</td>
<td>10</td>
<td>10 testing questionnaires; 2 recording pens; 1 camera for video and photo</td>
<td>1 hour per family</td>
</tr>
<tr>
<td>5. Service design workshop with children</td>
<td>Rorschach Test</td>
<td>10</td>
<td>2 recording pens; 1 camera for video and photo</td>
<td>30 minutes</td>
</tr>
</tbody>
</table>

After on-the-spot visit, the results of field research showed that the actual situation was almost consistent with the expectation on the aspects of family backgrounds and educational contents.

The main issues found during research are as follows:

1. The children were too young to express themselves well. They might have high enthusiasm to be engaged, but the efficiency of communication was not satisfying.
2. The parents were active. But their responses were not consistent with the children’s and the real situation. On the other hand, the parents mind of domestic education that it is enough
only to provide sufficient sustenance for children brings difficulties for the project development.

3. Lack of outdoor space and narrow teaching space. Most settled in rebuilding places, the kindergartens meet problems in detail like interior construction and the height of stairs. Usually, a group of children are gathered in a big classroom because of lack of individually playing space. The teaching contents depend on the arrangement of each kindergarten. Most teaching tools were made by teachers, which cost too much time and have got old and shabby.

![Figure 2 The main issues found during filed research in migrant children kindergartens.](image)

The critical issues were defined through practical research with tools of service design, four design prototypes were produced after co-creation, which aimed to train children in design thinking and help the educational system rebuilding to achieve educational equality. In the service system (Gadrey, 2002) of preschool education for migrant children (service target), parents (requirement proposer), kindergartens and teachers (service provider) are the main research targets.

1. Service provider (kindergartens and teachers): The kindergartens for migrant children locate mostly around urban outer loop and suburban loop, closed to the living place of migrant families, with the problems of imperfection of facilities, lack of teacher and teaching resources, uneven levels of teaching quality but high standard for registration.

2. Service target (children): The society and parents usually concentrate on the “knowledge” and “skill” that children learn, but ignore their requirements on emotion, psychological health and individual development. Impressive mental problems can easily appear because of the lack of parent-child communication.

3. Requirement proposer (parents): The parents, commonly lowly educated, are mainly working as physical labours whose jobs may be replaced by automation in 10 years. Neither can they provide help on children’s studying, nor do they have spare time or energy to accompany their kids, which cause the absence of domestic education.
After analysing the results of research and confirming the exact issues, the design team groups made desk researches respectively. Delivered from the research, strategies of redesigning migrant children’s education guided the following design process.

### 3.3 The strategies of redesigning migrant children’s education through service design

The importance of preschool education lies in how a person’s habits, interests and values are shaped. The project team tried to find various touch points from safety, health to mental requirements. What children need more are the attentions and cares on their psychological development. The key points below are results from discussions and co-creation with the project team and stakeholders:

#### 3.3.1 D-STEAM via the Internet

D-STEAM combined concepts of STEAM Courses. STEAM (Science, Technology, Engineering, Art, Mathematics) modularized courses, advocated by the American government, aimed at boosting the education quality in science, technology, engineering, art and mathematics in K12 project, which is the new global educational tendency under backgrounds of integrative subjects. Integrated courses are encouraged to engage diverse fields of knowledge and establish closed connections among subjects, which provides students with comprehensive diversified learning environments and guides them to solve problems by practicing theories from multiple fields. MOOC (Massive Open Online Course) provides interactive user forums that help build a community for students, teachers, and parents against traditional course materials such as videos, readings and problem sets. MOOCs have the potential to serve as “educational positioning systems” that precisely navigate students through their curriculum along individual “pathways and routes to maximize student success.”(Linda and John, 2012).
Several points need to be noticed:

- The connections between theories and practices in real life.
- The process of learning, rather than the results of grades after test, deserves more attention.
- It is required to form a legible and interactive preschool education system through methods of information design and games online without the limits of time and location, which will help to fill the studying gap in front of children from needy families.
- Information base (information of parents and students): a collection of parents’ contact information will help teachers and parents communicate timely and efficiently. Parents are able to receive information from school on platforms of Wechat or other Apps while they are encouraged to participate in education process.
- O2O instruction for parents: an integrated O2O instructive plan for parents from diverse social fields and income level can help parents acquire their children’s learning requirements.
- App service: The App service has functions of timely guidance and updating information, which can facilitate the parent-teacher and parent-parent communications and collaborations.

3.3.2 Engaging more stakeholders in the holistic view

The holistic view in this project is not simply equal to the design for courses or teaching tools. The concepts of “ways of working”, “ways of living in the world”, “ways of thinking” and “working tools” in cultivation model for future talents in the 21st century (Maria, 2016) helped the research team to consider the system comprehensively and develop realizable design cases.

Participations of NGOs and social corporations can help to build empathy among stakeholders, enhance educational service quality and solve other complex problems. The financial flows can also operate smoothly by engaging commercial models from public welfare organizations. What’s more, teachers (the service provider) can be helped to gain professional training and positive vocational management, which is a new way for housewives accessing to employment. As the Early Childhood Family Education Plan in Minnesota, USA, for example, it provided advanced early education for children, based on household nursery recruiting and training house wives as teachers, which helped those women’s career development a lot.

3.3.3 Redefining the critical stakeholders

The teacher is the key link to the final satisfaction to service and the service quality. Not enrolled in the personnel system of public education department, teachers in kindergartens for migrant children are not able to get professional titles or join the vocational award list. They are under intensive working and stressing pressure but lack of supports from relevant polities, which bring about a general low satisfaction to this job. Therefore, the experience of providing education service needs to be emphasized in design.

The preschool educational model of Community + Kindergarten, developed from aspects of space, teaching contents and personnel support, can help ease the burden on teachers effectively. As Gestwicki mentioned in 1991, more resources in the community are available for teacher to design courses. Communities can offer the natural, human and physical resources that are needed in children’s social learning while teachers are capable to access those resources (Carol, 1991). Brief Guidance for Kindergarten Education (Trail) (Ministry of Education, China, 2001), mentioned that, “frequent co-operations should be built among kindergartens, families and communities… all sorts of resources are supposed to be gathered to create beneficial conditions for children’s development.” Functions of kindergartens and communities need to be integrated organically through the awareness of sharing and collaboration to stimulate educational transformation. For instance, a special space settled in kindergarten, like community caring centre or vegetable-planting area, can offer caring service for children and let children learn more about nature and society, which helps their healthy growth in community.
4 Design process and prototypes

4.1 The Power of Play: teamwork learning

Play, love, and work may constitute separate and distinct dispositions, they function most effectively when they operate together (Elkind, 2007) With multicolour clay as the teaching tool, activities were designed and organized by the design team to build and improve children’s awareness of cooperation and team spirit.

The design team used the Rorschach Testing to learn the psychological status of migrant children. They also tried to communicate with the children by playing games with them and shot the process to record their emotions and behaviours in case of their limit on communication ability and emotion control.

According to research, the material of clay was chosen as a new teaching tool to match the redesigned teaching process: 1. Color learning: children learn colors from clays in different colors; 2. Exchange and co-operation: children need to accumulate diverse colors of clays by exchanging or mixing with others’ to learn knowledge of color and how to communicate with others as well, which can relieve the children from pressure of unacquainted environment; 3. Co-creation: a group of children are organized to fill colors into a simple pattern frame together by using their own clays, through which they can experience the pleasure of teamwork and art creation. Their works, at last, become decorations of their classrooms. The testing team, comprised of a kindergarten teacher and 6 children, half are boys and half are girls, experienced a 30-minute testing (equal to a class time). It showed from the recording video that the children were excited in learning knowledge of colors and mathematics, and they finally finished a pattern work together, which matched with the design concept. Most process worked by kids themselves while the teacher just gave some supports on organizing. The teacher thought it was an efficient teaching project because it was attractive to kids and easy for teachers to accomplish teaching work with 50% discount on workload. Meanwhile the kids were so interested in the whole process that they even asked more testing time to play with clays.
4.2 Mushroom Growth Plan: aesthetic training

The design group was inspired from current inferior decorations in the kindergartens. Aesthetic education, which is easily overlooked in preschool education for migrant children, is the critical point of this project. It also can be regarded as an effort to transfer the aesthetic education service from elite educational content to popularization.

For testing, the project team organized 4 groups of children (3 children per group) to co-operate and create a simple pasteup work. Under the proper guidance, children are able to express their emotions and release their negative moods through art methods. When the teaching way transformed from unilateral to participative, children’s enthusiasm can be aroused and teachers’ skill can be improved meanwhile. The art works by co-operation has the power to raise children’s aesthetic awareness, their self-confidence and also the sense of group honor.

Having co-designed with charity organizations, the design group produced a new service journey: the project will get financial support from sponsors in the migrant labors’ hometown through online platform of public welfare organizations; volunteers will be recruited mainly from university students in Shanghai to help teachers with preparation of materials, organization of activities and co-creation about paste-up work, color filling and some easily controlled and low-expense art works. Volunteer recruitment information is published on platforms of university student unions and relevant Wechat pushes. At present, voluntary training is going to be started with more than 30 applications have been uploaded. And the project team is trying to find access between voluntary service and university CETs transferring.
4.3 Kuang-kuang: knowledge of hometown

The children migrate to Shanghai with their parents almost have no idea nor memory about their original hometown, according to the research, around 70% to 80% migrant children will come back to their hometown when they get elder. The problem of adaption to unfamiliar environment will confront with them again. Peer tutoring enabled students to critically evaluate cultural stereotypes and reflect upon their own cultural practices (Ghassan & Bohemia, 2015).

To introduce knowledge of different hometowns and strengthen the sense of regional identity, a traditional type of paper-made train as a new teaching tool, named “Kuang-kuang” (imitating the sound of running train), was created by the design team, which carries puzzle pieces of their hometown, local food cards, dialect books and instructions for teachers and parents. Every kid holds one carriage about his or her hometown and learns the place by playing with the stuffs inside under the guidance of teachers or parents. The carriages of train can be connected by nylon tape, which is convenient for children to communicate with each other and play together. Through the prototype testing, parents and teachers showed great interests in this project. Their memories about hometowns were reminded when they join into it and they could share abundant experience and stories with their children. “Peer Tutoring” could be seen as a beneficial intervention or lesson for the parents and teachers, (according to research, most teachers are also migrant from other provinces.) which can help form a positive learning interaction from kindergarten to family, and children may have a deeper affection to their hometowns.
4.4 Accompanying storybook and App

Family education is the basic support of academic and social education. But the parents of migrant children are seldom aware to spend time on accompanying with their children. The pictorial storybook and App available for parents and children in this project were designed to tackle the very problem. Parents and children complete the illustrations in the storybook together and then upload their works and photos on the App platform sharing with other families, on which an online gallery will be formed to collect precious memories of accompanying time to improve domestic affections. The storybook was finished and gained warm welcome from children and parents. As for the app, the parents praised it, but it kept its step before commercial exploitation because of the lack of financial support.

4.5 Feedbacks

After four-week design process, the project team presented their work and held an exhibition in YANG DESIGN Museum, in which part of stakeholders like volunteers (20%), teachers (50%) and designers (20%) were invited from Shanghai Charity Foundation, the United Way, Minhang District Bureau of Education, Shanghai and kindergartens for migrant children, from whom comments and suggestions were gathered. As the staffs from Bureau of Education said, the educational transformation could be inspired by the service design for preschool education in this project, which was an unprecedented trial. Teachers from kindergartens raised some specific advises on details about material recycling and organizing activities. The presenting process was supported and reported by some mainstream medias in China like IFENG.COM. The whole project was displayed on Shanghai Design Week afterwards and received good reputation. When looking into the results of feasibility election voted online, “The Power of Play” gained most favorable rate (32%), other groups shared the rest percentages in turn as follows: “Aesthetic training” rated 30%, “Kuang-kuang” rated 28%, and “Accompanying story book and App rated” 26%.

5 Conclusion

This research is among the first attempt to solve the issues related to education for migrant children sectors, though their needs to develop more China specific and innovative approaches to fit the local complexities. The working group have mind to validate and optimize our service design approach against the feedback along the way going forward, and bring up the research on the prototype of the diversified service innovation as project subjects in next phase. The future research will pay more focus are as follows:
In this global knowledge-based economy, design requires a brand new and more proactive attitude toward economic and social change. Designers involved in such projects need to take the initiative with all stakeholders together to find new ways and possibilities, and act as guides and organizers to drive the “things” to take place (Lou, 2016). On the other hand, designers’ in-depth capabilities are becoming more and more important. In this project, interdisciplinary knowledge such as contemporary tutoring and early childhood psychology help designers create new service design tools to solve complex problems.

At present, it is very difficult for the migrant children kindergartens to bear the cost of expensive equipment. The design of low cost and easy replication is still the focus of current teaching for migrant children. Eventually the ICT (information, communication, technology) based design approach cannot be implemented in this project. From a long-term point of view, high-tech based approach will significantly help establish a clear and cordial pre-school education system and reduce the labour intensity of kindergarten teachers to effectively tutor, and moreover, bringing kindergarten children to online learning is important for their future training. How to control costs and facilitate the replication of ICT education is the research direction going forward.

For the moment design-involved education focuses more on the design of the physical environment, such as the design of kindergarten fields, the environment and teaching aids, but lack of intangible environment design. Intangible refers to the social relations of people in life and related information including: family atmosphere, kindergarten style, kindergarten culture and teacher’s ethic codes. Unlike other areas of education, preschool education places strong emphasis on developing the whole child - attending to his or her social, emotional, cognitive and physical needs, in order to establish a solid and broad foundation for lifelong learning and well-being.

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6 **Referencing**


About the Authors:

**BO Gao** is the associate professor and master instructor of teaching and researching on service design, information and media design, sustainable design in the College of Design & Innovation, Tongji University.

**QING Deng** is a master degree student majoring in Media and Communication Design, College of Design and Innovation, Tongji University.