Gamified Participatory Museum Experience for Future Museums

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Abstract. Museums are cultural and educational institutions that collect, preserve, display and study their collections, and whose purpose is to represent nature and human beings, and provide knowledge and education to the public. Based on the participation and education of museums, this paper demonstrates how to enhance museum participatory and educational experience for visitors by means of gamified participatory experience. It systematically explains the concept of museum participatory experience for visitors. By trying to apply the new concept and method, we designed the "SPORTSWEAR EXHIBITION - Dress to Win" at Design Exchange Museum, Toronto, Canada. We studied the impact of gamified participatory experience and analyzed the effectiveness of using new technologies. Finally, we understand the importance of participatory experience in future museums.

Keywords: Museum · User centered design · Participatory experience · Participatory design · Gamified experience

1 Development for the Needs in Museums

Early museums emerged in the wealthy individuals as private collections. At the early days, collections were usually confined to the interpersonal circle of individuals and a few wealthy classes. Opening to the public is almost impossible. Even if it is open, it can only be seen and reached by a small group people at a specific time. Over time, the collection of museums was slowly opened to the public, and now more and more can be accessed by the public.

Now museums have evolved into places with multiple functions, including protecting, entertaining, learning, and education etc. According to the ICOM Statutes, adopted by the 22nd General Assembly in Vienna, Austria, on 24 August, 2007 "A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment" [1].

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People's understanding of museums and their exhibitions is constantly changing. Museologists and international museum associations have been modifying and refining the definition of museums. Nowadays, under the information age, experts and scholars are trying to present collections in a better way, which includes showing the value of the exhibition, and also contains sills to guide visitors. This requires the full participation of visitors. But how could museums build a good relationship with visitors in their context and understand the needs?

With the development of social economy, the increasing demand for the culture life of public, further study of museum and cognition development, museums are transforming from collection-based to visitor-oriented. In order to provide better exhibitions and education for visitors, museums have to open up their materials and invite people to participate, create and link to each other. For museums, their task is to make exhibitions more open and to better understand the needs of their visitors.

2 Museum Participatory Experience and Problems

In the participatory museum experience, we wish that visitors should be active participants rather than passive consumers. In museums, visitors should be able to create, share, and connect with each other through the contents of exhibitions. Create means that visitors can contribute their own ideas, objects, and creative expressions to museums and each other. Share means discussion among visitors that they can bring ideas home, integrate their new creativities then share it again. Connect means the social communication between museums and visitors, or special interests between museum employees and visitors. It is very important that the dialogue and innovation among visitors should be centered with museum theories, ideas, and collections.

The goal of museums nowadays is to encourage dialogue, express ideas, or share learning and working together. Every design process starts with some simple questions. The question here is, what tools and techniques can we use to create the need for participatory experience?

In the current museum experience design, Designers study visitors' experience in many ways, and design labels and contents for different visitors. Designers know what kind of interactions can stimulate visitors, and what can lead to deep thinking and exploration. But in many cases, they might be incorrect. Basically, designers are guided by experience. The quality of the decisions they make during design will determine whether they can successfully delivery their ideas or create a sound experience for visitors.

When museums want to develop participatory experiences, it is very important to consider how visitors can create, share, and connect each other's experiences through content. The biggest difference between traditional and participatory design is the way information flows between museums and visitors. In traditional exhibitions, museums provide content for visitors to consume. Designers focus on consistency and quality of content so that visitors can have a reliable and relatively good experience, no matter what background or interest they have.

In most cases, there will be a guide to lead visitors to museums. The guide is usually a staff member of museums. He or she presents the single voice of authorities

(museums). The introduction will be prepared by museums and exhibitions and information are very well structured. This is the most common case. It is a one to more structure. This is a typical traditional and passive experience. Visitors are consumers that they can only passively consume the given information (Fig. 1).

Fig. 1. One to more

On the contrary, in participatory design exhibitions, museums need to support multi-directional experience of the content. Museums act as "platforms" that connect different visitors. Visitors will play the role as sharers, creators, observers, and collaborators of the content. Because visitors play different roles that means museums could not guarantee the consistency of their experience. Instead, museums provide opportunities for different visitors to create experiences together. Museums and visitors, visitors and visitors share and create content together. Every visitor should be a member or a part of create of meaning in museums (Fig. 2).

More to more is a new museum experience which is a new form. It requires visitors' participation and it encourages visitors to create meaning in museums. Our understandings of society are based on our personal experience and the explanations provided by others. If these understandings are only based on personal experience, then human consciousness may be very limited. Our knowledge is built on the communication between us and our surrounding environment. Museums, as research institutions, can play an important role in defining our physical world and personal identity.

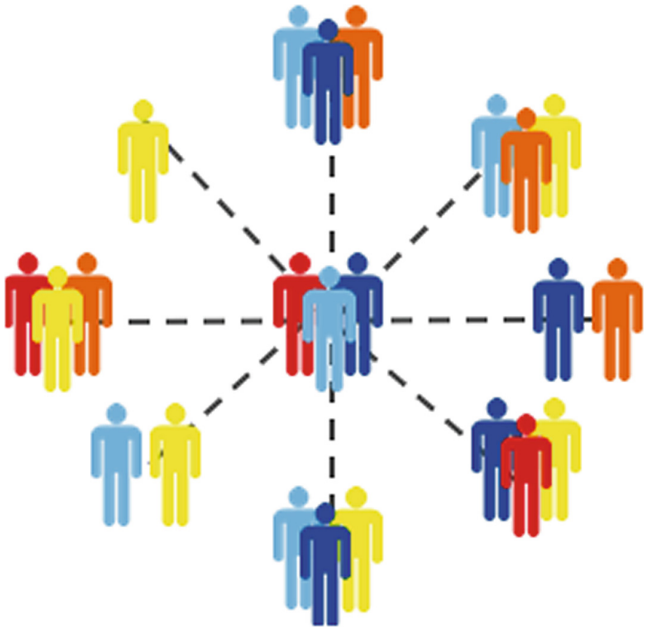

Fig. 2. More to more

3 How to Create Participatory Museum Experience

3.1 The Concept of User Centered Design

It would be a great help to design a participatory museum experience if we have a deep understanding of user-centered design. UCD emerged in the 1970 s due to the development of human-computer interaction. The principle of human-computer interaction is to copy or translate users' knowledge into principles or instructions that the designer can work on. According to Preece's study in 2002, in UCD, users are the center of information sources [2]. The aim of UCD is to find out a lot about the users and their tasks, and using this information to inform design. In UCD, during the process of the design cycle, designers should pay attention to what is being designed (products, interfaces, services, etc.) and looking for ways to meet users' needs [3].

The ultimate goal of UCD is to provide users with an optimized product, process, or system. UCD requires thinking from the users' perspective throughout the design process to understand the relevant cognitive level of users in order to achieve the goal. In addition, UCD requires to observe and think from the users' perspective from the beginning of the design. Users will be the core and fundamental part of the design process.

In 1977, a study by Nisbett and Wilson (Nisbett, R. E. and Wilson), they claim if users were given an active and central role in the design process that more useful and better ideas will emerge [4]. In addition, through the UCD approach, it is possible to

eliminate the gap between the traditional systems actually works and the way users perceive and interact with it.

3.2 The Development of UCD

In 1999, UCD defined by the ISO (International Certification Standard). The standard number is 13407, which clarifies the UCD basis principles. "The goal of the standard is to ensure that the development and use of interactive systems take account of the needs of the user as well as the needs of the developer and owner to name but a few stakeholders [5]." ISO Standard 13407 was updated in the later development and was newly released as ISO9241-210 "Human-computer interaction and human-computer interaction ergonomics, Part 210. It presents a higher and broader overview of activities that suggested for UCD.

This standard includes 6 basic principles to ensure that real users are placed at the center of the design process. They are:

1. Design needs to be based on a clear understanding of users, tasks, environments and other factors.
2. As users, they will participate in the entire design and development process.
3. Design needs to be carried out, revised and refined by using UCD assessment.
4. The whole process needs to be interactive in real time.
5. Every design issue or question should be related to users' experience.
6. Design teams need to have interdisciplinary capabilities and perspectives.

By following the principle and process of UCD, the finished products will be easier for users to understand and use [5]. The six basic principles of UCD can be divided into four stages to execute (see Fig. 3).

- The first stage is the analysis: We need to know who are going to participate and what functions are going to use in what kind of context.
- The second stage is to refine: Identify users' requirements and goals.
- The third stage is design and prototyping: Design will be divided into several phases and provide solutions for each one. Develop the design from a rough concept to a real product.
- The fourth stage is the evaluation: The best way to get feedback is from user experience testing.

There are many uncertainties in the process of user-centered design. According to the specific needs of users, user-centered design can be done in different ways. In traditional user-centered design engineering projects, users are primarily involved in the phase of usability testing. But in new user-centric design requires users to be involved in every design stages from concept to prototyping.

3.3 Concept of Participatory Design

The idea of participatory design emerged in Scandinavia in the 1970s, partly because local unions promoted workers to have more democratic rights so that workers could better control their job changes [7]. Since then, in participatory design, user

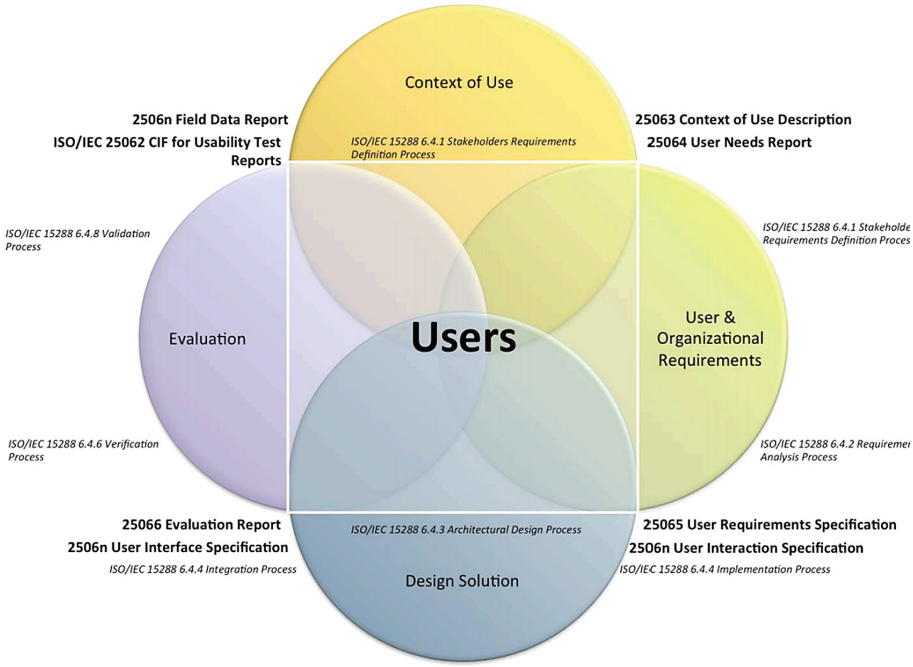

Fig. 3. User centered design process [6]

engagement has reached a deeper level: as users can participate more actively in the design process, it is more likely that they can become an important part of the entire design team [8, 9].

Sanders defines participatory design as a new attitude to design, which requires new ways of thinking and working. In addition, she introduced the concept of co-design that people can design together. In this way, people will have the opportunity to get better ideas and extend their ideas more effectively [3].

Nowadays, participatory design is defined as a set of theoretical and practical methods, which emphasizes that the role of the user should be fully involved in the whole design process. Basically, users are people who get involved in the design. Participatory design has increasingly mentioned and used as the first step in user-centered design.

3.4 Participatory and Gamified Design in Museums

Since the 1960s and 1970s, museums have begun to pay attention to the growth of their visitors and the economic potentials. They used new methods and methods to create a better experience for visitors. Museums and exhibition designers have gradually begun to pay more attention to the needs of visitors. Different participatory techniques and methods foresee how visitors will participate individually in different levels of participatory experience.

When visitors become active participants in the design process, the designer need to focus their concerns on visitors' needs and the motivations behind their actions. The greatest wealth of the museum is actually the creativity of their visitors. No matter what the topic of the exhibition is, visitors will have a lot of very interesting ideas, and no matter subject is, they also would like to share their opinions too. Especially younger visitors, who are more skilled at applying and mastering new technologies than older visitors, and using their abilities to express their ideas and opinions.

3.5 Techniques for Design with Visitors

In participatory design, every design partner (participants or design experts) should establish common goals and participate in design activities together. So far, we have a lot of ways to design with different participants.

In participatory design activities, we need to ensure that the results and contributions created by participants are taken seriously. In the participatory design process, no matter what impact participation may have, it should be able to go beyond the general procedure of traditional design, and truly support design to become meaningful and proactive activities.

In some design projects, participants have been able to get involved in all design stages. Experts and designers are responsible for analyzing participants' work and testing them as prototypes for applications. There will be two phases in participatory design projects. First, is to define the theme, then brainstorming. Second is to create the prototype. We can do a lot of interesting activities to help participants making prototypes.

In 2016, Alexandra's new book Resilience by Design (Advanced Sciences and Technologies for Security Applications) mentioned, if participants are able to actively participate in collaboration and integrate into the design process, they will have a sense of responsibility for the projects or tasks they are involved in [10].

3.6 Gamified Participation

Over years a lot of researchers have spent so much time on defining what a "game" is. In 2013, Adams defined the game as "a type of play activity, conducted in the context of a pretended reality, in which the participant(s) try to achieve at least one arbitrary, nontrivial goal by acting in accordance with rules" [11].

Game has become an important part of the "human cultures" in our life [12]. When people play games, they can have a positive influence. For example, games can promote a wide range of cognitive skills. Game can be an effective way to encourage and stimulate emotions. Games can develop social skills [13]. In 2015, Jane mentioned in her book Super Better that traditional video games are more complex and harder to master, and they require that the player learn a wider and more challenging range of skills and abilities [14].

In 2012, McClarty et al. described a theoretical and experimental evidence of games play. They claim that the use of games in education can provide the following advantages: 1. learning principle. 2. Engagement of the learner. 3. Personalized

learning opportunities. 4. 21st-century modern learning skills. 5. Environment for authentic and relevant assessment [15].

Game is one of the most participatory activities. In 2001, Prensky's research shows that at first, games need to be as simple as possible at the beginning (simple is easy to participate). A game should be fun and engaging so that the player can reach an active state (interesting can increase engagement and encourage player continually to participate to reach active state). Moreover, it is very important that game has a defined structure with rules, and a good story to transfer emotions. And there are some more important elements. For example, results and feedback (players can have feedback information which will encourage them to keep participating and learning). Conflict, Challenge, and Competition (make players feel satisfied and constantly stimulate their adrenaline). Solutions (inspire the creativity of the participants) [16].

3.7 Encourage Gamification

Using gamified experience to encourage participation and learning through play is a very effective way. By using this theory as a way to make participation and educational activities more entertaining and engaging can make participation and learning more smooth and effective. Therefore, the use of gamified methods has recently appeared in different types of research and literature.

The broad definition of gamification is the process of defining the elements which comprise games, make games fun and motivate players to continue playing [17]. There are so many studies have shown that use game elements in a non-game environment (such as school and classroom) can influence behavior. These studies show that gamified products are not necessarily games. Instead, they use only some elements of game design to encourage people outside of a game context. The same mechanism can also be used to encourage collaborative and cooperative behavior [18].

Now we have a lot of researches on gamification. Games are a form of participation, interaction, or entertainment, and learning as a participatory process can benefit from adopting game concepts into it [11]. The gamification of education or the gamification of learning, especially, integrates game-like concepts into the learning process, so as to engage learners or participants in associate with their natural learning context [18]. The purpose of gamification learning is to "maximize enjoyment and engagement through capturing the interest of learners and inspiring them to continue learning" in their own context [19]. Gamification has the potential of "disruptive innovation" for institutions with traditional educational functions (museums are one of the typical sample), which changes the future in a positive way [20].

4 Design Practice: SPORTSWEAR EXHIBITION - Dressing to Win!

Sport is ubiquitous touching almost every aspect of our lives from health and wellbeing to fashion, culture, technology, design and architecture. "SPORTSWEAR EXHIBITION - dressing to win" was held at Design Exchange Museum, Toronto, Canada. The exhibition is about sportswear, which has a history a little more than a century. Its

evolution has been rapid largely due to its strong association with technology. This exhibition is divided into four sections associated with ethnographics, nature, fashion, and performance. Although there are four different themes, but we hope to provide with a complete experience. Our target audience will be involved with different types of visitors, especially young ones. At the early stage of planning, in order to make the abstract concepts easier to understand, we drew them into maps. Based on these two maps, we could have better analysis and design (See Fig. 4).

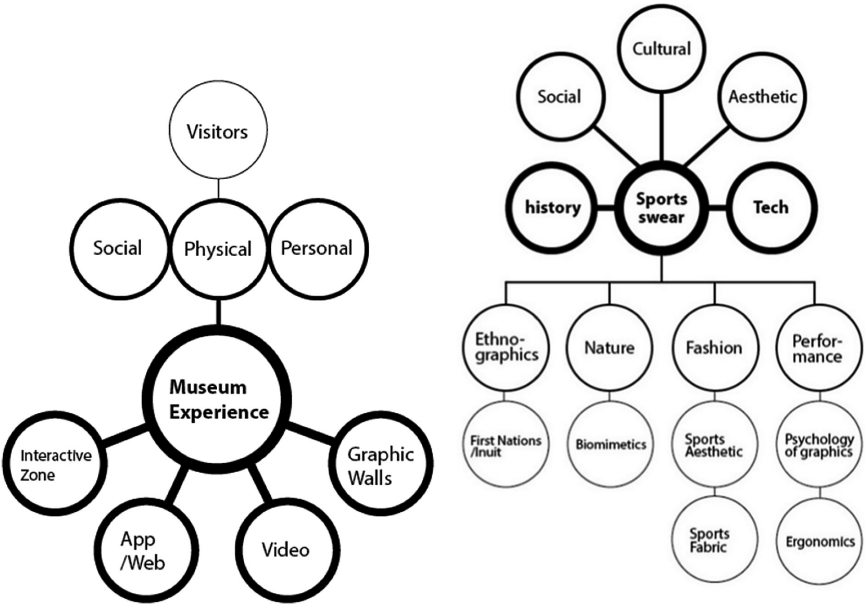

Fig. 4. Visitor experience maps

These two maps can be used for: 1, to show the physical space of exhibition, collections, and visitors' personal experience are all related to the museum experience. 2, the themes of the exhibition and the content and information need to be delivered to visitors. At the stage of research and the process of planning, we have been constantly comparing these to maps to verify the ideas and possibilities of encouraging visitors.

4.1 Two Phases for Gamified Participatory Design

The first phase: We invited five participants of different genders and ages to come together and design the museum exhibition, which can meet their own needs. We took them to visit the exhibitions in the Design Exchange Museum then gave them a small assignment to make a note during the visit. After the visit, they were required to develop a set of "good" and "bad" standards of the museum experience.

Then we introduced the basic exhibition ideas for the participants such as exhibition theme, content, objectives, etc. and gave them some green and red labels.

Participants were then asked to recall the good or bad experience in the exhibition and to write down the reason why they are good or bad. Good ones are on green labels and bad ones on red labels. After that, we categorized labels into groups. Participants will cross compare the experience of the exhibition with the content of the labels to discuss it.

After the discussion, most of the questions on the labels will be incorporated into the concept design process. Then participants will begin the second phase. The work of the first phase provided a good foundation and support for the later work of participants. Meanwhile, it provided some pieces of evidence for museums to evaluate. According to the research data of museums, many of the questions mentioned by the participants are similar to those in many evaluation summaries of the museums themselves.

The second phase: We did in the lab at school. We asked participants to create an exhibition concept. The outcome would be the concepts and ideas for the exhibition. At this phase, we will refer to the labels summarized in the first phase, to adopt as many good standards as possible to get positively influence, while avoiding negative emotions. Then we will ask participants to work along to construct their own basic ideas for the exhibition (see Fig. 5).

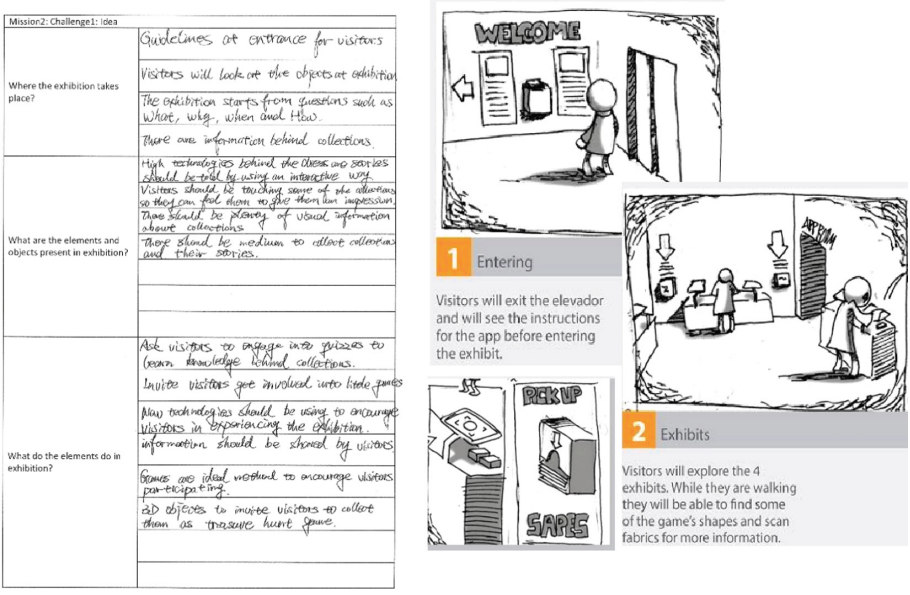

Fig. 5. Form for concepts and ideas (Form by Erin Lu, Storyboard by Paula Aguirre Gómez) Form finished by Erin Lou, Storyboard drawing by Paula Aguirre Gomez

We will guide participants to create stories and ideas for the exhibition and understand the needs of the visitors by asking them to fill out some design forms. In order to fill in this form with a better result, participants will use the method of sharing.

By answering some simple questions, for example: how does the exhibition begin? How are the collections of the exhibition presented? In what form? The role of collections in the exhibition and how could they encourage the visitor to participate? After answering these questions in the forms participants will transform the concept of the exhibition into a prototype. These forms will help participants and us to identify some relevant exhibition design elements, development, and specific methods for encouragement. Each participant should have his or her own prototype when all these works are done. All participants will share their prototype design together and they will refine or improve their design in terms of color, functions and goals. Finally, everyone will work on further details for the prototype.

In the following work, participants were asked to design different levels of participatory experience of the exhibition through other forms, and complete the core mechanism documents of the exhibition visit. The core mechanism documents were based on the previous concept document. Participants kept working on the core mechanism documents or the exhibition and built the level of participatory experience of visitors. Then participants will work on details of the exhibition design based on the progressive relationship between the levels (see Figs. 6 and 7).

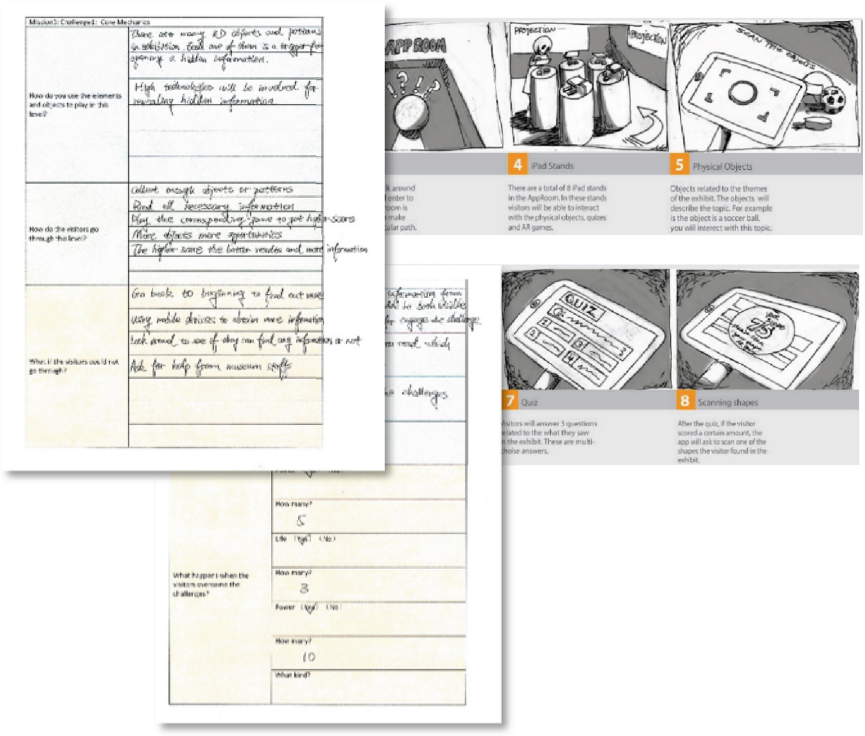

Fig. 6. Forms for core mechanism (Form by Erin Lu, Storyboard by Paula Aguirre Gómez) Form finished by Erin Lou, Storyboard drawing by Paula Aguirre Gomez

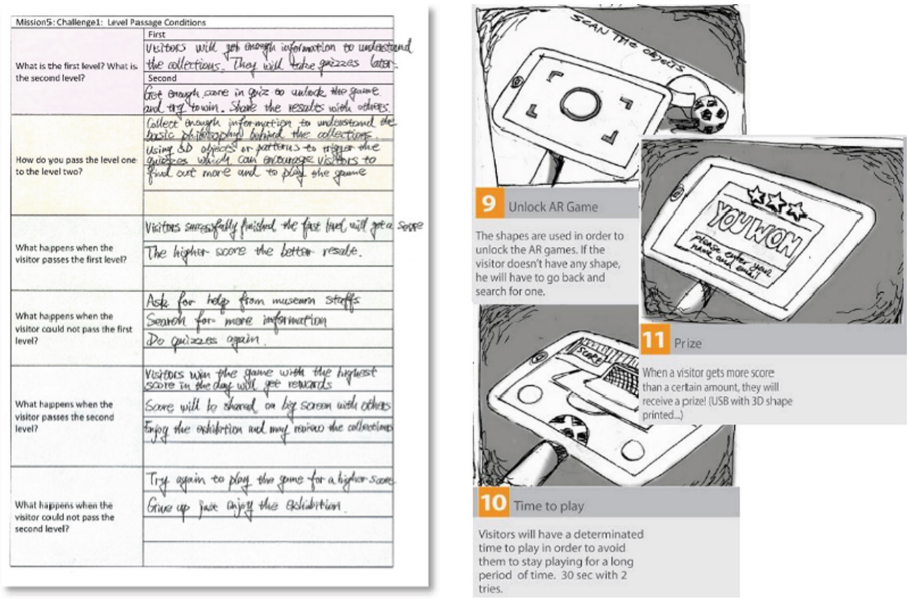

Fig. 7. Level passage conditions (Form by Erin Lu, Storyboard by Paula Aguirre Gómez) Form finished by Erin Lou, Storyboard drawing by Paula Aguirre Gomez

4.2 The Final Outcomes Are

- Conditions and conceptual design for transfer between different levels during the visit.
- A complete concept design of participatory museum experience.

Finally, we asked participants to show their design prototype of the design and demonstrate the interactions of participation and functions.

Participants would ask each other of their interest and write down their comments on cards. Participants will share these card and then write down answers for every question for each other. After answering questions, they will vote for everyone's prototype and choose the most favorite design.

5 Conclusion

In this gamified museum participatory experience design practice, we found that the quality of the final design results will be gradually improved over time. This demonstrates that participants shared ideas, improved concepts and learnt to work together by doing participatory design. Designers need to be engaged in the dialogue with participants all the time during the different design process and explain the museum exhibition design based on their professional knowledge. It can be very helpful for participants to improve their design results.

Gamified participatory experience can create collaboration and encourage visitors' participation. In gamified participatory experience process, cooperation means that participants work together to explore and learn together. Different participants working together can form some kind of heterogeneity, which can help museums receive more ideas. Gamified participatory experience can enhance visitors' sense of personal responsibility. Besides, there is an important value for a gamified participatory experience that can encourage face-to-face communication. Providing visitors more opportunities to participate means encouraging them to get involved in exhibition activities, and to promote positive emotions. Giving visitors more responsibilities means stimulating them to explore and express their ideas.

According to the research and practice prove that participatory design is positive and effective, and also shows that we should encourage visitors as the designer to participate in museum exhibition design. These findings from the practical research can provide professional and valuable references and guidance for future participatory exhibition design activities.

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